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Use 1½-Ton Trucks in Quarry

Hopkinsville Stone Company, Hopkinsville, Kentucky, Has New and Efficient Operation

ONE OF THE newer Kentucky crushed stone plants is that of the Hopkinsville Stone Co., located near Hopkinsville in the western part of the state, which was put into operation in June, 1931. It is well laid out for efficient operation and has a capacity of about 1000 tons of crushed stone per day.

Trucks are used for transporting the stone from the quarry to the crusher and have been found very satisfactory. The rock is a tough limestone, covered with 4 to 6 ft. of overburden. Some large boulders are found in the overburden and these are broken up by block-holing so that they can be handled along with the rest of the rock.

Since the upper part of the ledge has some dirt seams through it, the quarry is worked in two benches, and the material from the upper ledge is hand-picked to be sure that it is clean. This upper ledge, which is 9 ft. deep, is shot separately and the pieces of rock are thrown down to the quarry floor by hand and are loaded there by the steam shovel.

The lower level of the quarry consists of a hard, fine-grained stone which core drillings have shown extends down at least 70 ft. The lower level was first worked on a 13-ft. face and this has since been lowered 16 ft.

Drilling is done with an Ingersoll-Rand wagon mounted air drill, the 1¼-in. holes being spaced 5 ft. apart. Forty per cent. gelatin dynamite is used, and Ingersoll-Rand jackhammers are used for secondary drilling and for breaking up the boulders in the overburden.

A ¾-yd. Erie steam shovel is used to load the rock to the trucks. Three Ford dump trucks each equipped with a 1½-ton body and with pneumatic tires are used to deliver the rock to the plant. The trucks have high gates so that the largest pieces can slide out easily and are usually loaded with 1½ to 2 tons of material. They must climb a 10% grade from the quarry to the plant.

A portable pumping unit is being used to remove the water from the quarry. This consists of an 8-in. centrifugal pump, manufactured by the Price Pump and Engineering Co., which has been mounted with a 25-hp. Fairbanks-Morse motor on a pair of wooden skids and is moved around the quarry as needed.

Quarry of the Hopkinsville Stone Co., showing small motor trucks for transportation

Crusher House

The crushing plant is of timber construction with corrugated iron covering. The storage bins with the screening equipment above them make up the larger part of the structure and a smaller wing houses the crushing equipment. The ramp leading to the crusher is of timber construction, and has a curved shape, so that the trucks go up one side and down the other. The shape of the ramp requires much less space than would be needed if it were in a straight line and also brings the trucks directly back to the quarry incline. An enlarged platform at the crusher permits the truck to be backed up to the crusher, and when dumped to be moved directly away with no further backing.

The primary crusher is an Austin "107" gyratory crusher driven by a 75-hp. Westinghouse motor. The crushed material is carried up in an Austin belt bucket elevator to a 60-in. by 24-ft. Austin revolving screen at the top of the plant. This screen is equipped with two dust jackets, extending over about one-third of its length. The elevator and the screen are both driven by the one 50-hp. motor.

The material from the dust jackets and also from the first section of the main screen is delivered by chute to a 4-ft. by 10-ft. double-deck Niagara vibrating screen. The throughs from this screen drop to a bin directly below, while the rejects can either be spouted to bins or delivered to a Symons cone crusher located alongside the primary crusher. When reducing the entire output to ¾-in. size a 2x8-in. diagonal partition is clamped on the vibrating screen, as shown in one of the illustrations, to divert the oversize to the reduction crusher.

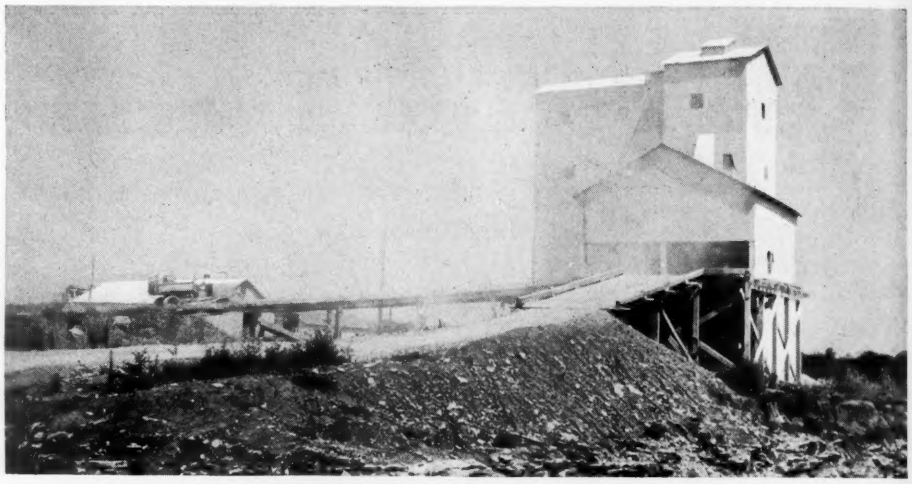
Adjustable metal chutes carry the sized stone from the other sections of the revolving screen to bins below. These chutes can be changed so that the stone can be run into different bins as desired or back to the Symons cone crusher for further reduction. The rejects from the revolving screen go to the cone crusher. This crusher is driven by a 60-hp. motor and discharges to the main 24-in. bucket elevator.

The six loading bins each have a capacity of 75 tons of stone. The lower part of the bin walls is made up of 2x8's laid flat and spiked together, and the upper part is made of 2x6's in the same way. Although the bins are about 25 ft. deep, this construction furnishes a strong structure which will not bulge under the pressure of the stone.

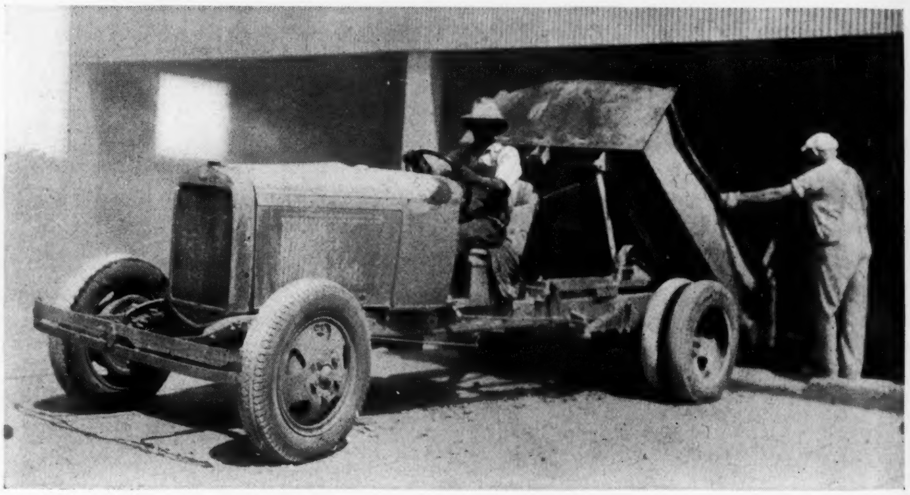
Each bin has two slide gates for the loading of railroad cars on the track under the bin structure. The use of two gates permit more rapid loading so that a car of 50 or 60 tons capacity can be loaded easily in five minutes. Another reason for the two gates is that thus a great deal of the segregation of the material in loading is avoided. The double piles are not as high as a single pile at the center of the car, and the rolling of the larger material down the sides of the pile is minimized to a great extent and segregation prevented. There are also chutes extending from the side of the bins for truck loading.

The plant is electrically operated throughout with all the controls centrally located on the ground floor adjacent to the crushers. This central control works for efficiency and safety and prevents one part of the plant from being stopped while other equipment piles up an overload. As a safety precaution stop buttons are located beside the main screen and the primary crusher.

Alongside the main plant is a smaller building housing an Imperial-Type Ingersoll-Rand air compressor. This is a double cylinder 2-stage unit with a capacity of 535 cu. ft. per minute, and is driven by a 125-hp. Westinghouse synchronous motor. The air is used almost entirely in the quarry, although some is used in the shop which occupies the balance of the compressor building. In this shop is a forge and an Inger-

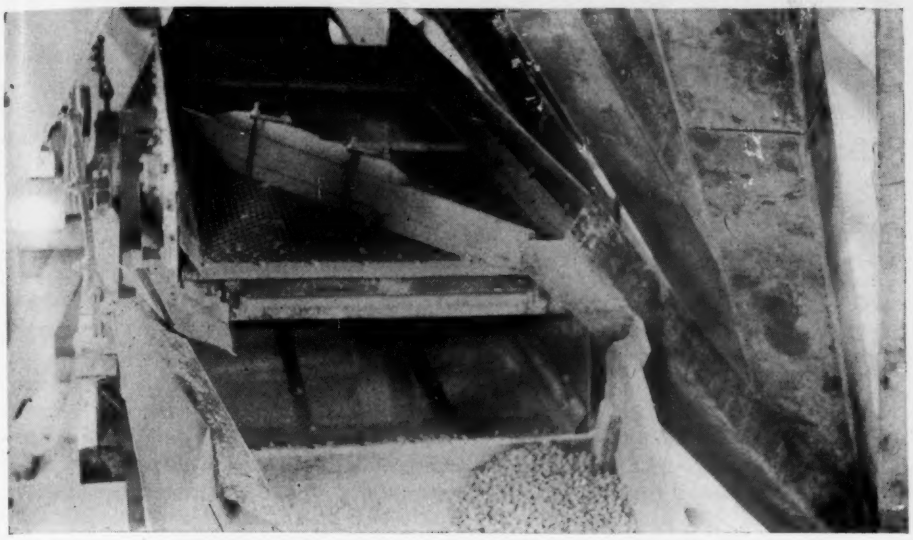


Showing motor-truck ramp to plant



Truck dumping to primary crusher

View of plant from quarry floor



Device to divert oversize of vibrating screen

soll-Rand drill sharpener for sharpening the drill bits. The cooling water for the compressor is kept cool by circulating it over a wooden cooling tower above a concrete tank at one end of the compressor house, the water running down from one level to the next in this rack, cooling off sufficiently to be used over again.

The company has built 1600 ft. of rock-ballasted side track to connect the plant with the main line of the Louisville and Nashville railroad. This siding runs past the bins for several hundred feet to permit an adequate storage space for empty cars. The empty cars are then let down by gravity to the plant as needed, and are also carried to the main line by gravity after they have been loaded. Besides being on the Louisville and Nashville railroad, the plant lies within the switching limits of Hopkinsville and so has access to the Illinois Central and the Tennessee Central railroads. These three lines give the plant good shipping facilities all over the western part of Kentucky. Some of the stone goes for railroad ballast, but most of it is shipped for road work of all types.

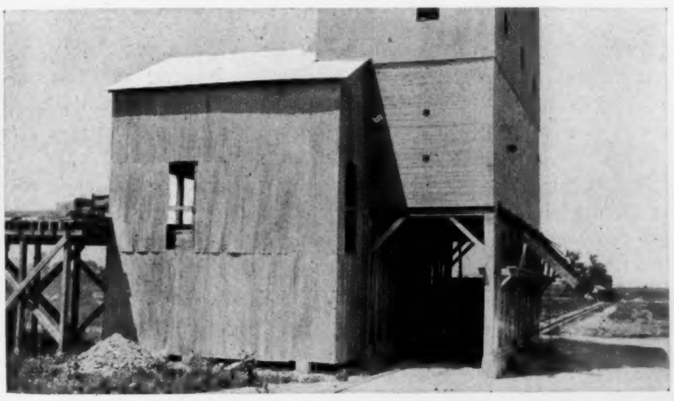
Some agstone and stone chips are stock-piled, this being done with trucks loaded from the regular truck-loading chutes. About half of the shipments are by truck for road work, the construction of hard roads having gone forward steadily in that part of the state. The company does some of its own hauling, but most of the stone is delivered to contractor's trucks at the plant.

Three men are required to operate the crushing plant, two feeders for the crushers and an electrician to oversee the electrical equipment. In the quarry 20 to 30 men are used, including the truck drivers and shovel operator. With this force it is possible to turn out 30 tons of concrete stone or 40 tons of asphalt chips per hour, these two sizes being the ones most in demand.

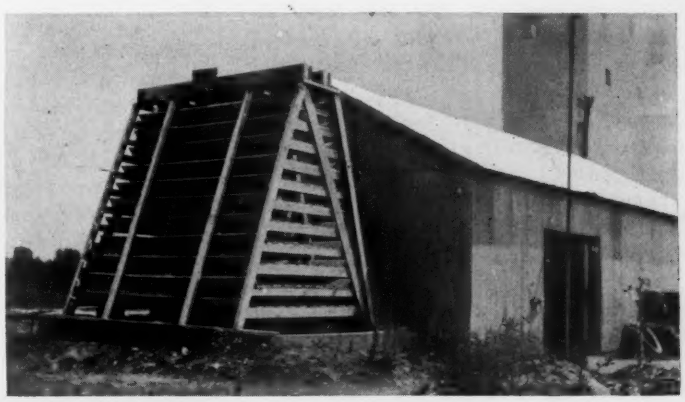
The plant office has a 15-ton Fairbanks scale for weighing the trucks and is also equipped for testing road material. The plant was built by the company's own organization in a period of four and one-half months. The quarry has already grown to considerable size, but the company owns 13 acres of land so that there will be plenty of room for expansion. Eventually the quarry will extend to the main line of the railroad.

Personnel

The officials of the company have been connected with the aggregate industry for a number of years. A. W. Partee, president, was maintenance engineer for the Kentucky State Highway Department for about 12 years. He also acts as sales manager for the company. W. H. Petri, vice-president and production manager, was engaged in contracting work on state highway construction for more than 10 years. Gates F. Young is also vice-president, and A. M. Andrew is secretary-treasurer.



Rail and truck loading bins



Home-made water cooler for air compressor

Stone neatly loaded for shipment

Effect of Age on Calcined Gypsum

With Particular Reference to Consistency and Water Content

By A. M. Turner,

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ONE of the greatest, if not the greatest, unsolved problem in the manufacture of calcined gypsum is the lack of knowledge of facts and conditions which control the phenomenon known as the aging of plaster.

In the foregoing it is assumed that the general understanding of aging of plaster is the change brought about in time, which results in the lower water carrying capacity of the material, loss of plasticity, inability to carry sand satisfactorily and the slowing up of the setting time.

During the past two years the writer has made a series of tests on plaster and recorded the results obtained on the accompanying charts, which will be discussed later.

The object of this experiment was to determine, if possible, the cause of deterioration of calcined gypsum, how it was brought about, and what methods might be used to improve the condition. The importance of the problem may be seen when it is realized that gypsum plaster only a few months old is from 10% to 20% less efficient than when first made, and a large amount of plaster which has been kept in storage a year or longer becomes a total loss. It might be mentioned that dealers are obliged to junk much aged plaster because the plaster contractor is always looking for the freshest material available and will pass by the older goods even though it might be used with satisfaction.

Resumé of Previous Literature

There are but few writers in the gypsum field who have given any information to the industry on the subject of aging of calcined gypsum. However, the following extracts from the writings of a few specialists in the gypsum world will convey their findings and conclusions.

D. C. Winterbottom, in his bulletin No. 7, "Gypsum and Plaster of Paris," pages 121 to 123, makes some interesting comments. He finds that plaster of Paris, after rehydrating to the hemihydrate, takes up a certain percentage of hygroscopic moisture, and then changes slightly from day to day according to the humidity of the air. Mr. Winterbottom states: "Experience has shown, and experiments by Professor Marston verify the fact, that wall plaster when kept for some time under ordinary conditions loses part of its ability to carry sand, while neat plaster, although quite old, attains a tensile strength equal to that of fresh plaster, but the adhesive strength of old plaster is very low." Quoting again from the author: "If plaster is stored continuously in a damp atmosphere it is quite possible to suppose that it may get back to the gypsum stage by gradual hydration."

Following are two more interesting paragraphs taken from Mr. Winterbottom's bulletin: "The presence of sea water or brine in the gypsum from which plaster of Paris has been made, is absolutely fatal to its keeping properties. This is due to the very hygroscopic nature of the salts contained in the brine, which in damp weather attracts the water from the air and rehydrates the hemihydrate to the dihydrate, thereby killing the plaster. Samples of plaster made by the writer from gypsum containing 0.5% of common salt, and small quantities of other hygroscopic salts, deteriorated very rapidly on being exposed to the air during damp weather, while samples made from washed gypsum which did not contain salt did not show deterioration."

"From the above it would appear that the deterioration of plaster on keeping is due to the presence of traces of deliquescent impurities and for this reason it is necessary to pack plaster of Paris in what are practically air-tight packages, those generally used being either casks or paper lined sacks."

During 1927 the U. S. Bureau of Standards made an investigation on gypsum. On page 66 in the January 4, 1928, issue of *Pit and Quarry* are the following paragraphs as stated by the Bureau of Standards.

"DETERIORATION OF CALCINED GYPSUM."

"The common method of storing calcined gypsum is in paper or cloth sacks, neither of which is air-tight. It has been found that calcined gypsum in certain cases, when stored for long periods in this manner, deteriorates. This deterioration is evidenced by poorer working qualities. The deterioration is by no means universal; gypsums produced in certain sections being practically free from deterioration while with those from other sections the deterioration constitutes a serious difficulty.

"While there is little evidence as to the cause of the deterioration, it is commonly supposed to be due to partial rehydration of the calcined plaster, caused by absorption of moisture from the air. From the varying rates at which this rehydration occurs, it would seem to be due, at least in part, to certain catalytic agents present in the form of impurities in the gypsum. This view is supported by some data on the effect of storage of gypsum developed at the Bureau of Standards for use in another investigation. In the course of this investigation several samples of calcined gypsum, representative of the industry throughout the country, were exposed to the air for six months. At the end of this period moisture determination showed that rehydration had occurred, and to a greater extent in certain samples than in others."

Walter B. Lenhart, in a series of articles written for ROCK PRODUCTS during 1927-28 made the following statement regarding the aging of plaster:

"The setting time of fibered hardwall changes slightly over long periods of time. For the first two months the change is so slight as to be hardly noticeable, but after one year's storage the setting time has about doubled. This is not serious in itself, as plaster a year old is usually aged to such an extent that it is practically worthless anyway."

During 1930-31, S. G. McAnally contributed a series of articles to ROCK PRODUCTS under the heading of "Gypsum and Gypsum Products Manufacture." From Part V. of this work are copied in part the following extracts:

"When gypsum plasters (not Keene's cement) are exposed over water they revert to raw gypsum.

"If deliquescent soluble salts are mixed with plaster in considerable quantity (over 1%), the plaster will eventually revert to raw gypsum.

"The above causes or conditions bring about chemical hydration of the plaster, and not aging in the desired sense.

"Plasters which do not contain deliquescent salts may be stored in air for over a year without becoming hydrated to gypsum.

"Aged plaster of Paris usually contains a percentage of water slightly in excess of that in the hemi-hydrate. Assuming that the theoretical quantity in the latter is 5.70% and that the aged plaster contains 6.0%, any attempt to duplicate the aged product, by controlling the calcination so that the calcined material will contain 6.0% water, is unsuccessful. Aging of plaster causes a physical change which is evidenced by a considerable increase in density (weight per cubic foot), lowering of the water ratio and the plasticity. Coarsely ground calcined gypsum may have a water ratio as low as aged plaster, but the former is plastic (sticky); the latter is not plastic. Aged plaster mixes easily with water in all proportions without forming lumps; fresh plaster does not.

"Moisture is essential for aging, but until all the soluble anhydrite has been converted to the hemi-hydrate by the absorbed moisture the latter does not function as an aging medium. The quantity of water or moisture required to age plaster is less than 1%, and, strange as it may seem, the rapid addition of a great excess of moisture (2% to 4%) does not achieve the desired aging effect. Hydration takes place, and the plaster becomes lumpy, quick setting and lacks strength, especially at the early periods."

Author's Own Experience

During the past two years the writer has been making periodic tests on samples of plaster which was manufactured in August, 1931, noting in particular the changes in plaster consistency, water content, setting time and working qualities, which took place.

It is on the consistency change of plaster that much of the following data is based, so the term as here applied will be discussed in some detail before going into the results of the research.

Consistency of plaster may be defined as its density or firmness when mixed with water. The ways in which this characteristic may be measured are numerous. However, in plaster testing, some standard for consistency must be adapted and used as a basis of comparison.

In the experiment herein described the standard consistency which was used was measured as follows: Water was mixed with 50 grams of plaster in sufficient amount so the resulting mass could be made to run out of a porcelain bowl with the slight aid of a spatula. This mixture was termed a standard consistency. Such a mixture made with the average plaster and poured from a bowl held two to three inches above a glass plate will form a patty roughly 3½ in. in diameter and ⅝ in. thick in the center. However, the size of the patty varies in proportion to the difference in the consistency of the plaster used. To designate the consistency of any plaster (usually tested neat), multiply the water used for 50 grams by 2. The result gives the percent water required for a standard consistency. For instance, if we speak of a plaster having a consistency of 75, it is understood that it would require 75 grams of water mixed with 100 grams of plaster to make the standard mixture or 37½ parts water to 50 parts plaster.

This method of determining a water carrying capacity may sound crude, but an individual operator can easily maintain accuracy within 1%, and the rapidity of the method is a desirable feature. The Southard viscosimeter and other types of apparatus are designed for making consistency tests. Most methods of making these tests are satisfactory as they give results which show the desired comparison.

The story told by knowing the relative consistency of plaster is of paramount importance in revealing the history of aging in plaster. Fresh plaster usually has a much higher water ratio than the same plaster when it becomes older. Its water carrying capacity is almost in direct ratio to the sand carrying capacity and the same comparison applies rather closely to its plasticity.

To demonstrate the change which takes place when plaster ages such an example as this may be cited. Fresh plaster has a consistency of 80 (100 parts plaster and 80 parts water make a workable mixture); will work satisfactorily with three parts by weight of sand, and has that fat butter like characteristic which the plasterer desires. This same plaster when several years old, (or a much shorter time under certain conditions) will fall to a consistency of as low as 60, will carry only 1½ to 2 parts of sand fairly well and to a large extent has lost its plastic and adhesive qualities.

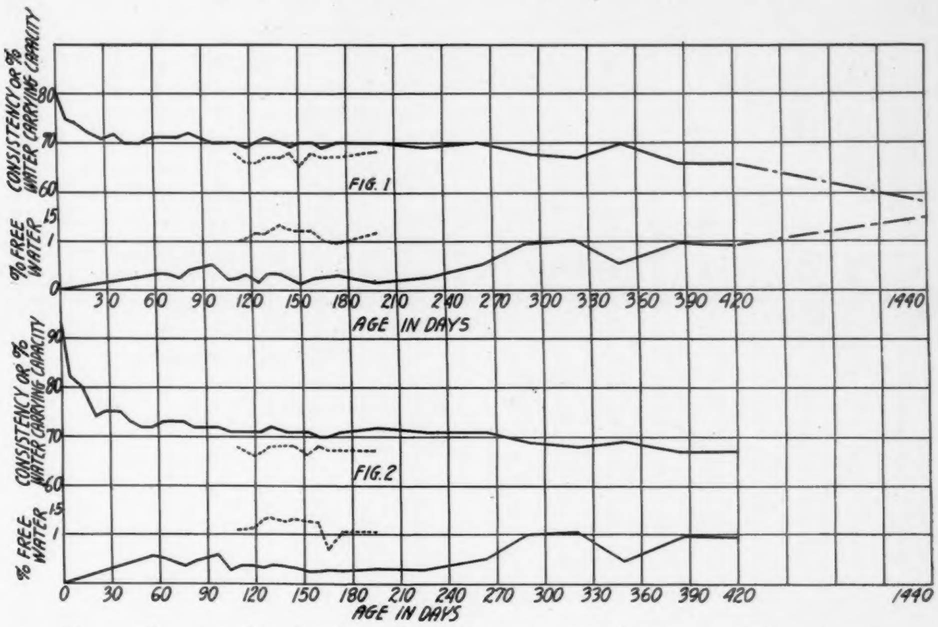
The above example will no doubt demonstrate how serious a problem the gypsum industry faces in the effect of aging of plaster and how desirable it is to find a remedy for this condition.

It may be said that plaster made from gypsite (known as earthy gypsum) does not age. This statement in a sense is correct, as gypsite plaster does not change appreciably with age. However, the dark plaster, as it is commonly called, may be considered aged when first made as it has a low water and sand carrying capacity when fresh. Fifty to sixty is the average consistency of gypsite plaster, compared to 70 to 80 for gypsum plaster. Fortunately gypsite plaster is and remains plastic, probably due to impurities such as clay. This condition can be duplicated to some extent with old gypsum plaster by mixing with it substances like clay, lime or diatomaceous earth.

Generally speaking we can say that consistency of plaster may be raised by finer grinding, raising the purity of the gypsum from which it is made, or the addition of materials higher in consistency than the plaster itself. The consistency may be lowered by the addition of deliquescent salts, slow calcination, high temperature calcination, or addition of materials lower in consistency than the plaster itself.

Charts Explained

The accompanying charts show consistency and free moisture content of retarded and unretarded calcined gypsum, plotted for various periods of time and beginning when the material was freshly made. The samples used were stored in paper bags left open at the mouth. These sacks were placed in the laboratory where the room temperature varied from 50 to 90 deg. F. and the relative humidity was between 60 and 84.



Charts Nos. 1 and 2 showing effect of age on retarded stucco (Fig. 1) and neat stucco (Fig. 2)

The results indicated by the dotted lines on the charts were obtained from portions of the same samples of plaster described above, which were stored in a moisture cabinet where the humidity varied between 95 and 99%.

Since aging is more detrimental to retarded plasters than any other kind, let us first examine the chart, Fig. 1, on which are shown the results obtained from a sample of plaster containing 4 lb. of retarder to the ton of plaster.

From a standpoint of general interest it is here stated that the plaster represented by the sample in question was manufactured by the following process: The gypsum was taken from a mine and put through primary crushers, which consisted of the jaw and gyratory type machines. Then the rock was put through a rotary dryer, ground with Raymond mills to a fineness of 98% through 100-mesh. The ground material was calcined for two hours in an Ehrsam kettle and dumped at a temperature of 335 deg. F. The resultant product analyzed 90.60% $CaSO_4H_2O$, 4.98% $CaCO_3$, and 2.60% miscellaneous minerals which consisted prin-

cipally of insoluble matter, iron and aluminum oxide, anhydrite and magnesium carbonate. When first made this calcined material contained no water in excess of that required to form hemihydrate.

Following the consistency curve beginning with the first day the retarder was mixed with the stucco it will be noticed that the water-carrying capacity (consistency) was 80%, but within a month or six weeks this figure dropped down to about 71% where it stayed rather closely for a period of about 200 days. Tests indicated that the slight variation in consistency the first few months was probably a result of a different relative humidity in the air on the different days when the samples were tested. (Humidity was recorded each day samples were tested.) As time progressed the tendency of the curve pointed downward although very slowly. From the results of tests the writer has made on samples of plaster several years old it appears that the consistency of plaster similar to that indicated on the curve would probably be about 58% in four years time with a free water content of 1.5%. The broken lines on the end of the curves in Fig. I, indicate these results. The sand carrying capacity and plasticity of the plaster under discussion has decreased in a direct ratio with the consistency curve. However, these properties can not be as accurately measured as the water ratio.

Next let us consider the free water content of the plaster (mechanically held water), and compare the change in this curve to the one we have just discussed. Plaster at first has no free water, but within a short time from 0.1 to 0.3% is taken up, and from all indications obtained by this research, it appears that it is this small amount of water which accounts for the water ratio of plaster rapidly dropping as indicated on the chart. Further proof of this statement is the fact that if plaster is kept in air-tight containers practically no change in consistency takes place over a long period of time.

Following the moisture curve as the sample becomes older, it is evident that as the mechanically held moisture increases in the sample the consistency is lowered. Additional evidence of this belief is seen by the curves shown by dotted lines which plot the results on the same sample tested for the other curves, but instead of being stored under normal room conditions it was kept in a moisture cabinet where the average relative humidity was 98%. The change brought about by storing the sample in the moisture cabinet was almost immediate, which shows that the humidity is an important factor in the aging of plaster. In practice it is a commonly accepted fact that plaster deteriorates much faster in damp climates than it does where it is arid.

One of the most interesting results of this research was to learn the fact that when the sample above mentioned was removed from the moisture cabinet and stored again under normal room conditions its consistency raised and free water lowered to approximately the same figures as those of that part of the sample which had not been subjected to high humidity.

At various intervals when free water, humidity and consistency tests were made, combined water analysis was also run. This analysis showed that the combined water remained very close to the theoretical amount of water necessary to combine with calcium sulphate to form the hemihydrate. For this reason a curve was not plotted to show these results as it seems that this would not be an important phase in this work.

While dealing with tests on retarded stucco it will be interesting to note the change in setting time which age brings about. For ten months setting time tests were made on this plaster at least once a month. The set remained unchanged for all practical purposes. Further tests were not made until the plaster was 14 months old and at that time the set was 15 hours and 30 minutes. In this particular instance it appears that a rapid slowing up of setting time takes place after the plaster becomes about a year old. A sample of the same calcined gypsum which was not retarded had not become slower setting in 15 months, showing that it is a change brought about by the retarder which lengthens the set. From various tests on old gypsum plaster it usually works out that the set is much slower than when the material was fresh.

Chart No. 2 Explained

Chart No. 2 gives the results obtained on an unretarded sample of the same stucco as used for Chart No. 1. The outstanding feature of this chart is the difference in the consistency test when the material was fresh. It had an initial water ratio of 90 compared to 80 for the retarded sample. The consistency rapidly lowered and approached the figures shown on the other chart, but averaged about two points higher. Undoubtedly the initial difference in water carrying capacity was a condition brought about by retarder being in one sample and not in the other. As previously stated deliquescent salts (assuming they are carried in retarder) lower the consistency of plaster. It is very probable that on account of the action of the retarder the retarded plaster has a little lower consistency all along the curve than the non-retarded plaster.

When observing the moisture curve in chart, Fig. 2, it may be seen that it bears the same relation to the consistency curve as the free moisture curve in Fig. 1 showed. The one fact which is difficult to reconcile is that the free moisture in the unretarded sample ran consistently a little higher than the retarded sample.

A portion of the sample of non-retarded plaster was stored in the moisture cabinet with the result that the free water immediately increased and the consistency became lower as indicated on the chart.

Discussion of Results

Before drawing conclusions from the results of the research so far described there are numerous kindred side lights which should first be mentioned.

More or less comment has been made on the relative merits of storing plaster in paper or cloth bags from a standpoint of keeping qualities. Paper plaster bags are practically porous to the atmosphere and it is only reasonable to assume that for long periods of storage the change of plaster in cloth bags would be practically the same as in paper sacks. For short storage periods the paper sacks may be preferable, and are undoubtedly superior for general use.

Plaster stored in bins when tested proves that aging has taken place very much slower than plaster of the same age which has been stored in sacks. This can be accounted for by the fact that the major portion of plaster in the bin does not come in contact with atmospheric conditions. The outside surface of plaster which is exposed to the air serves as a protective coating for the material farther toward the center.

As previously stated admixtures of plaster with such substances as clay, hydrated lime, diatomaceous earth, flour and like substances increase the consistency of the plaster. The following figures are the results obtained by adding a certain kind of flour to plaster:

% Flour used	Consistency of mixture	Time of set
0.0	71%	33 min.
0.1	73%	31 min.
0.2	75%	31 min.
0.6	77%	35 min.
1.0	81%	37 min.

A practical use of the property exhibited by the flour in the above tests is found in the manufacture of plasterboard. The flour is mixed with the stucco which is used for the plasterboard filler. It gives the paper on the board a tighter bond and reduces the amount of stucco per unit volume in the board. The consequence is that a lighter board is obtained.

Following are some interesting figures found by testing two samples (different brands) of plaster of approximately the same age.

Brand	Total water content	Free water content	Consistency
A	6.59%	0.33%	68%
B	6.30%	0.21%	54%

Although sample *B* was somewhat lower in gypsum content than *A* the difference was not sufficient to cause the great variation in water ratio, nor would any variation existing in grind cause the difference. However, it was found that sample *B* contained a chloride in some form. Thus, in this case it was the presence of a deliquescent salt in the plaster which caused the extremely low consistency.

Deliquescent salts may naturally occur in gypsum deposits or be added during the process of manufacture. One gypsum company in its process for making casting, moulding, dental, gauging or any plasters

where density and strength are important factors, sprays a solution of calcium chloride into the kettle while the gypsum is calcining. This treatment will lower the consistency from 10 to 20% according to conditions and requirements. The outstanding difference between artificial aging, the process just mentioned, and natural aging is that plaster which ages naturally during a period of long storage loses its plasticity and ability to work fat, and this is not the case with artificially aged plaster.

Numerous tests were made on aged plaster by driving off the mechanically held moisture with heat and observing the change, if any, on consistency. When the free moisture is driven off plaster that has aged a comparatively short time the effect seems to be rejuvenating. In one particular instance the consistency was raised from 71 to 76. However, tests of a similar nature made on plaster from six months old to several years old showed very little if any increase in consistency.

A field practice which is frequently used to make old plaster workable with a fair degree of success is to mix about two No. 2 shovels of hydrated lime with 100 lb. of plaster and use about 25% less sand than in fresh plaster. The lime hastens the set of the plaster, which has probably become slow. It increases the water and sand carrying capacity of the plaster and adds plasticity. Once old plaster has been applied to a wall and sets it has greater strength than fresh plaster.

Another factor in aging which is worthy of mention is the effect of size to which plaster is ground, and the method by which it is ground. A fact which is generally accepted is that the finer the grind the more rapid the deterioration of the plaster. In a sense this is probably true. That is, the finer material has a higher consistency than the coarse material so naturally there is a larger margin for consistency drop, which accounts for the higher degree of aging.

Gypsum is ground by the use of many different types of machines. Also various stages of grinding are practiced. In some instances the final grinding is done before calcination, while other manufacturers make the initial grind before calcination and the final reduction after the gypsum is calcined. However, the fundamental changes of deterioration of the finished product remain the same and there is very little reason to recommend one method over another. There is, however, a favorable result obtained by tube mill regrinding. The product obtained in this way is more fluffy (weighs less to a unit volume) than that produced by most other types of grinding. The material also has a tendency not to lose with age its fat working qualities nor its ability to float sand, as rapidly as the same material produced by other common grinding methods. Nevertheless tube-mill ground stucco decreases in water and sand carrying capacity just as rapidly as stucco produced by other methods.

There is difference of opinion in the gypsum industry as to what causes the phenomenon in tube-mill plaster above described. Some authorities give credit to the fact that the particles produced are flat in shape as compared to the product otherwise obtained, while others feel that the quantity of superfines produced affect a colloidal state of the plaster which brings about a desirable creamy mixture.

Conclusions

From the foregoing discussion the following conclusions may be stated with a reasonable degree of accuracy.

Natural aging of plaster is the change brought about by the absorption (taking up as mechanically held water) of a small amount of free water (0.2 to 1.5%) which results in the plaster decreasing in water and sand carrying capacity as well as losing much of its adhesive and plastic qualities.

Artificial aging of plaster, brought about by the addition of deliquescent salts or water, reduces the water ratio and sand carrying capacity, but does not eliminate the adhesive and plastic property in the same proportion as natural aging does.

The rate of natural aging depends largely upon the relative humidity of the air in which the plaster is stored. The consistency drop is almost in direct relation to the amount of mechanically held water in the plaster. The higher the percent of water the lower the consistency.

There can be no fixed rule used as an accurate guide to determine the rate at which plaster will age, because various conditions, particularly humidity, govern the rate any given plaster will deteriorate. Different samples of gypsum, all manufactured into plaster by the same method would give products of vastly different consistency, depending on such factors as physical conditions of the gypsum rock, purity of the gypsum, kind and amount of impurities.

The most effective way of producing artificial aging is probably by the method of spraying calcium chloride solution into the kettle during the calcination process.

Retarded plaster does not normally change greatly in setting time for nine or ten months, but soon afterwards may become much slower setting.

High consistency plaster is desirable for wall plaster because a unit weight of such plaster will cover a greater wall surface than the same weight of low consistency material.

Low consistency plaster is desirable where high strength and density are required (as in casting and moulding work), because with such a plaster the maximum amount of material will occupy the minimum of space.

Although the lowering of consistency and an increase in mechanically held water in plaster is apparent with an increase in relative humidity of the air in which the plaster is stored, it also seems obvious that these same aging factors would occur in time even though the humidity remained constant throughout the entire period of time.

If the free water is driven off slightly aged plaster by heat the consistency of the plaster will become higher approaching its original water ratio. However, as plaster becomes older similar treatment does not seem to have the same reaction.

Plaster stored in bins does not age nearly as rapidly as plaster stored in sacks.

Plaster stored in air-tight containers shows very little aging effect.

The best practical method for storing sacked plaster so it will keep to the best advantage would be in an absolutely dry warehouse where the humidity was very low and the higher the temperature the better, as long as it did not exceed about 125 deg. F. Concrete floors or walls in a warehouse are undesirable, especially if they come in contact with the ground.

From the evidence at hand it seems possible that there would be a real advantage gained in storing plaster if dealers would provide themselves with tight storage tanks of bins where plaster could be stored in bulk. Then as orders were received for plaster it could be sacked out of the bin by the dealer and delivered. This suggestion is merely a hypothetical case.

Some writers have suggested the advisability of packing plaster in air-tight containers as a means of preserving plaster. This suggestion in all probability would go far toward keeping plaster in its original condition. However, for this method to be employed with success it would be necessary that the packages be absolutely air-tight throughout. The cost of such a process is apparently so great that the method is considered prohibitive.

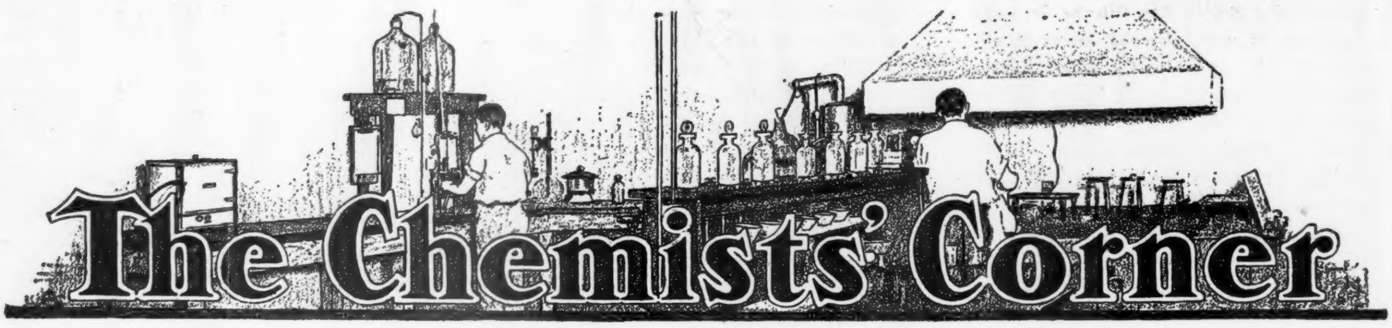
Needless to say there are many causes and effects in connection with the aging of plaster which are simple and apparently obvious. On the other hand much of the phenomenon is obscure and in the available literature on the subject little or nothing is said about certain conditions which are encountered. For instance experiments show that when plaster has taken up 0.3% of water the consistency of the sample has fallen from (citing an extreme case) 90% to 70%. Three-tenths percent of water bringing about so large a change in water ratio is a little hard to reconcile.

The subject of plaster aging is one which is far from completely solved and the problem is one which would justify the attention of research fellows in universities, or an assignment which might be worked out through the efforts of the industry.

Portland Cement Yardage

AWARDS of concrete pavement for April and for the first four months of 1933 are announced by the Portland Cement Association as follows:

	Sq. yd. awarded during April, 1933	Sq. yd. awarded to date, April 29, 1933
Roads	379,079	8,265,770
Streets	157,013	785,278
Alleys	34,197	41,752
Total	470,289	9,092,800



The Recast Analysis and Its Relation to the Chemistry of Portland Cement*

Part XI—Computation of Portland Cement Raw Mixtures (Concluded)

By Louis A. Dahl
Research Chemist, California Portland Cement Co., Colton, Calif.

A COMMON METHOD of calculating mixtures to a predetermined potential composition is to convert the potential composition to an oxide basis, and then calculate the mixture from the oxide analysis. This method and the direct method which has been described should give identical results if the work is done accurately in both cases. The direct method has the advantage that the results are expressed in terms of potential composition, and it is therefore possible to use the final equations as a means of determining the limits of the range of portland cement compositions which can be made from the materials. This will now be shown.

It has already been mentioned that when a mixture is calculated by means of simultaneous equations a negative value for the fractional proportion of any material indicates that the mixture cannot be made with the materials used in the calculation. The range of mixtures which can be made is therefore the range in which the calculated fractional proportions of all of the materials are positive. The limits of this range are therefore represented by compositions in which the fractional proportion of one or more of the materials is zero. In the foregoing problem, for instance, the limits may be found by equating to zero the values found for x, y and z. These will be considered in the order y, z, x.

(Equation for y)

$$-2.0816 + .0295a + .0319b = 0$$

This is a linear equation of the first degree involving two variables, and can therefore be represented graphically by a straight line. Only two points are required to locate a straight line. In Fig. 18, the horizontal axis is the a-axis, and the vertical axis the b-axis. The easiest method of locating the line is to locate the intercepts on the axes.

$$\text{If } a = 0,\ b = 2.0816/.0319 = 65.3$$
$$\text{If } b = 0,\ a = 2.0816/.0295 = 70.5$$

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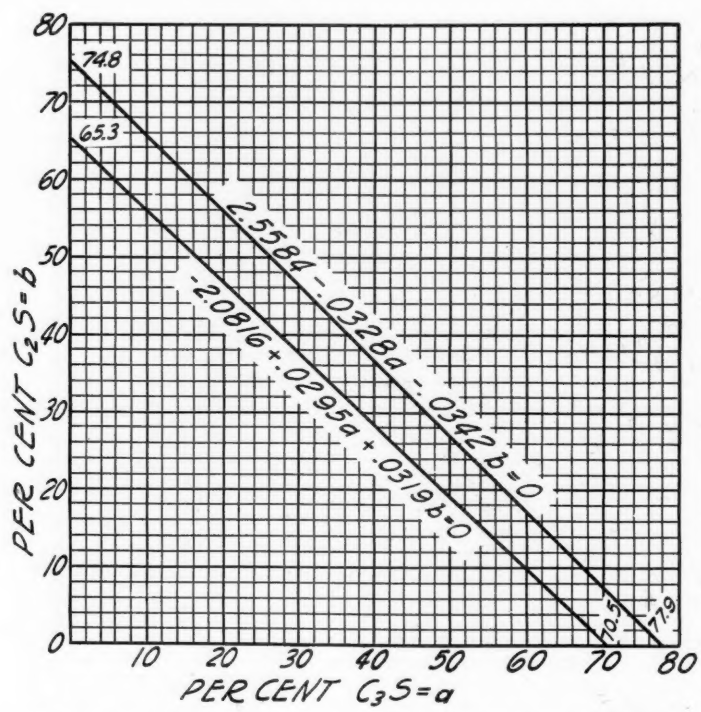


Fig. 18. Plat of a linear equation of the first degree involving two variables

The points (0, 65.3) and (70.5, 0) are the intercepts on the axes, and consequently serve to locate the line representing the equation on the graph (Fig. 18).

Similarly, the equation for z gives the intercepts (0, 74.8) and (77.9, 0), locating the line in Fig. 18.

The equation for x has positive coefficients throughout. Its intercepts are both negative, so that the line representing the equation does not fall inside of the graph. This indicates that material A must always be used, and that it will not have a negative value in any computations of mixtures. The compositions which can be made from materials A, B and C are therefore located between the two lines shown in Fig. 18.

In making experimental mixtures it is sometimes desired to use a raw mixture from the mill as a base mixture, adding extreme materials to make such compositions as may be desired, in every case using a maximum proportion of the base mixture. The problem is illustrated graphically in Fig. 19. In the figure, R, S and T represent extreme materials, and M the mill raw mixture to be used as a base mixture in maximum proportion. Any mixture in the triangle RMS can be made from R, M and S or from R, S and T, or it can be made from R, M, S and T. In any case R and S are

used, while M and T are alternative materials. The maximum amount of M is used when no T is used. Similarly, in triangle MST the maximum amount of M is used when R is omitted; in triangle MRT, the maximum amount of M is used when S is omitted. In the computation of mixtures in which this plan is to be used the determination of the extreme material to be replaced by the base mixture is an essential feature of the problem. An ingenious method of performing the computation has been devised by Steinour and Woods.[6] The method can be applied as readily to computations involving potential composition as in its original application to computations involving oxide composition, as will now be shown.

To illustrate the problem, it will be assumed that materials A, B and C (Table 7) are the extreme materials, and that M, the raw mixture to be used as a base material, has the composition 54% C_3S, 20% C_2S, 26% C_3A. The first step is to calculate the proportions of A, B and C required to make the composition M. Substituting $a = 54$, $b = 20$ in the equations in Series 32, it is found that $x=0.7471$, $y=0.1514$, $z=0.1015$. If m is the fractional proportion of M used in a mixture, $0.7471m$ is the fractional proportion of A which is eliminated by the use of M. The fractional proportion of A in the mixture is therefore represented by the equation,

$$x = .5232 + .0033a + .0023b - .7471m$$

Similarly,

$$y = -2.0816 + .0295a + .0319b - .1514m$$
$$z = 2.5584 - .0328a - .0342b - .1015m$$

These equations represent a general solution of the problem. Now let us suppose that a mixture of the composition 58% C_3S, 14% C_2S, 25% C_3A is to be made, in which case $a = 58$, $b = 14$. Substituting these values in the equations, it is found that

$$x = .7468 - .7471m$$
$$y = .0760 - .1514m$$
$$z = .1772 - .1015m$$

The first step in determining the maximum value of m is to note which equations have a negative value when $m = 1$. In this case the first and second equations meet this condition. These equations are set equal to zero, and the value of m calculated for each.

x-equation, $m = 0.9996$
y-equation, $m = 0.5020$

The least of these values, 0.5020, is the maximum value of m. Material B, represented by the equation from which the maximum value of m is obtained, is the material replaced by M. The fractional proportions of A and C are found by substituting 0.5020 for m in the x and z equations respectively.

$$x = .7468 - .7471 \times .5020 = .3718$$
$$z = .1772 - .1015 \times .5020 = .1262$$

[6] Calculation of Raw Mix for Experimental Production of Clinker. H. H. Steinour and Hubert Woods. ROCK PRODUCTS, Vol. 33, No. 6, pp. 75, 76 (1930).

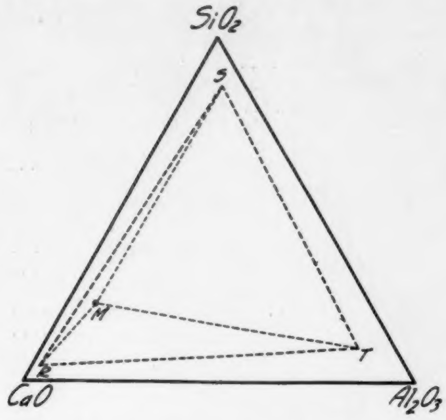


Fig. 19. Illustrating graphical method

The materials to be used in the mixture are therefore,

	Per cent.
A Material	37.18
M Material	50.20
C Material	12.62

In Fig. 19 the base material M is located inside of the triangle RST. When the fractional proportions of R, S and T required to make the composition M are calculated, the values are positive. In some cases the mill raw mixture used as a base material is of such composition that it cannot be made from the extreme materials, which corresponds to locating M outside of the triangle RST. In that case one or more of the calculated proportions are negative. This does not interfere with the computation in any respect, since it is only an intermediate step. The equations for the fractional proportions of extreme materials, with the added term involving m (the fractional proportion of M) may be written as in the previous problem. In this case the coefficients of m will not all be negative, but will be opposite in sign to the fractional proportions of extreme materials required to make the composition M.

In illustrating methods of calculating mixtures we have used problems involving three components, CaO, SiO_2 and Al_2O_3. In problems involving more than three components the methods are exactly the same. The three-component problems have been used because the principles involved may be described graphically, so that the reader may visualize the operations involved. The reader who has followed and understood the computations which have been described can easily apply them to problems involving more than three components.

In all of the computations it has been assumed that no volatile components such as moisture and carbon dioxide are present. This has been done in order to permit the reader to confine his attention to the principles involved in calculating mixtures in which the sum of the oxides is 100%, without frequent digressions to consider the matter of calculating from a raw basis to a clinker basis, and vice versa. In calculating mixtures of raw materials the order of procedure is as follows:

1. Calculate compositions of raw materials to a clinker basis.

2. Calculate fractional proportions of materials required to obtain the desired clinker composition. The calculated proportions are on a clinker weight basis.

3. Convert fractional proportions from a clinker weight basis to a raw material weight basis.

In calculating compositions of raw materials to a clinker basis there are three methods which may be used: (1) dividing the composition throughout by (100 — ignition loss)/100; (2) dividing the composition throughout by (100 — blast loss)/100; (3) dividing throughout by (sum of non-volatile oxides)/100. In illustrating the computations we will use the third method. The system which will be described may be used as well with the first and second methods, if either of these is preferred. The essential thing is to be consistent, using only one method throughout in any single computation.

Let us suppose that the materials in Table 8 are to be used.

TABLE 8—COMPOSITION OF RAW MATERIALS

	Material		
	A	B	C
SiO_2	2.87	66.15	52.45
Al_2O_3	2.87	17.64	26.23
CaO	51.61	4.41	8.74
Loss	42.88	10.62	12.34
Total	100.23	98.82	99.76
Sum of oxides	57.35	88.20	87.42

To convert to a clinker basis by the third method, the percentages of SiO_2, Al_2O_3 and CaO in A are divided by 0.5735. Similarly, the composition of B is divided by 0.8820, and C by 0.8742, obtaining the following compositions on a clinker basis:

TABLE 9—COMPOSITIONS CALCULATED TO A CLINKER BASIS

	Material		
	A	B	C
SiO_2	5.0	75.0	60.0
Al_2O_3	5.0	20.0	30.0
CaO	90.0	5.0	10.0

If these compositions are compared with those in Table 7 they will be found to be identical with them. Equations for calculating fractional proportions of these materials to a pre-determined potential composition have already been calculated (Series 33) as follows:

$$x = 0.5232 + 0.0033a + 0.0023b$$
$$y = -2.0816 + 0.0295a + 0.0319b$$
$$z = 2.5584 - 0.0328a - 0.0342b$$

In these equations x, y and z are the fractional proportions of A, B and C respectively (clinker weight basis), a is the desired C_3S value, and b the desired C_2S value. Let us suppose that a composition 62% C_3S, 10% C_2S, 28% C_3A is desired. The fractional proportions of A, B and C are found by substituting 62 for a and 10 for b in the above equations, obtaining

$x = 0.7508$, the fractional proportion of A
$y = 0.0664$, the fractional proportion of B
$z = 0.1828$, the fractional proportion of C

These proportions are on a clinker weight basis. To convert to a raw material weight basis, each of these figures must be divided by (100 — sum of oxides)/100.

Material	Fractional proportions (clinker basis)		Proportioning factors
A	0.7508	÷ 0.5735 =	1.3092
B	0.0664	÷ 0.8820 =	0.0753
C	0.1828	÷ 0.8742 =	0.2091
			1.6936

The last column represents parts by weight of materials *A, B* and *C*, weighed in their original raw state, to make a clinker of the desired composition. To make 1 gram of clinker of that composition 1.3092 g. of *A*, 0.0753 g. of *B* and 0.2091 g. of *C* will be required, a total of 1.6936 g. of raw mixture. To obtain a given weight of clinker the desired weight may be multiplied by each of these values to obtain the weight of the materials to be used in making the raw mixture. Because the values in the last column may be used as factors to obtain weights of raw materials, we have called them "proportioning factors." The weights obtained will be in the same units as the unit used to express the desired weight of clinker.

Some readers may be confused by the fact that we have divided by (100 — sum of oxides)/100 both in converting from a raw to a clinker basis and in converting from a clinker to a raw basis. It should be noted that in one case we were dealing with compositions, and in the other case we were dealing with fractional proportions.

The mathematical principles involved in the calculation of experimental mixtures apply as well to mill problems of controlling the composition of the raw mixture fed to the kilns. The application of these principles to mill problems is a broad subject in itself, since it involves flow of materials in the mill, facilities for storing and blending materials, etc. It is not the author's intention to discuss such problems in this paper. It is believed, however, that the relation of potential composition to burnability of cement raw mixtures and to the course of crystallization, which has been described in an earlier section, constitutes evidence that an effort should be made to place control of composition and the heat treatment applied to the material on a scientific basis. There is much to be learned in regard to these matters, and it is hoped that our effort to analyze the problem mathematically will open up fields of research which will lead to a more accurate knowledge of the chemical reactions which occur in the process of manufacturing portland cement.

(The End)

A Correction

The Editor:

In the installment of my article in the April 25 number of Rock Products there are some errors which I believe should be corrected in the next issue. All of them appear on page 29.

In the middle of the page, column 2, the three equations should be as follows:

$$(A)\quad 294.80x_2\ldots\ldots = -984 + 244a + 225b$$
$$(B)\quad -208.05x_2\ldots\ldots = -204 - 22a - 533b$$
$$(C)\quad x_2\ldots\ldots = 0$$

The equations which follow should be:

$$\begin{array}{lll}
(A) & & 294.80x_2\ldots\ldots = -984 + 244a + 225b \\
(D) & (294.80 \times C) & 294.80x_2\ldots\ldots = 0 \\
\hline
(E) & (D - A) & 978.88y_2\ldots\ldots = 984 - 244a - 255b \\
(B) & & -208.05x_2\ldots\ldots = -204 - 22a - 533b \\
(F) & (208.05 \times C) & 208.05x_2\ldots\ldots = 0 \\
\hline
(G) & (B - F) & 939.13y_2\ldots\ldots = -204 - 22a - 533b \\
(H) & (F - 978.88) & y_2\ldots\ldots = 1.0052 - 0.2493a - 0.2299b \\
(I) & (G - 939.13) & y_2\ldots\ldots = -0.2172 - 0.0234a - 0.5675b \\
\hline
(J) & (H - I) & 0.0312z_2 = 1.2224 - .2259a + .3376b \\
(K) & (J - 0.0312) & z_2 = 39.18 - 7.24a + 10.82b \\
(L) & (I \text{ transposed}) & y_2 = -0.9002z_2 - 0.2172 - 0.0234a - 0.5675b \\
(M) & & = -35.49 + 6.49a - 10.31b \\
(N) & (C \text{ transposed}) & x_2 = -y_2 - z_2 \\
(O) & & = -3.69 + 0.75a - 0.51b
\end{array}$$

Although it is stated in the article that "since the equations which follow are identical in their left-hand members with the equations used in the original solution, only the first term is used in each case," it would be much clearer to readers, I believe if the series of points (....) were used in each case in which it appears in the manuscript, in order to indicate that the terms after the first are omitted. This is particularly true since equations *J* to *O* inclusive do not involve omission of terms.

Louis A. Dahl.

Colton, Calif.
May 9, 1933.

Decomposition of Cements in Sea Water

Henry Le Chatelier, the well known French authority on the constitution and uses of cements, writes in *L'Age du Ciment* for October, 1932, on the effect of sea water on cements. He says that the reasons for the slow decomposition of cements in rain water, river water, waters containing gypsum and finally in sea water are beginning to be well understood.

First Factor. Hydrolizing Action of Water. If in the laboratory we wash a briquette of mortar in distilled water, free from carbonic acid, the hydrate and other compounds of lime are dissolved in proportion to their solubility. The porosity of the mortar is augmented and finally the specimen goes to mud. The minimum quantities of water necessary are: ½-liter for 1 gram of sulphate of lime, 1 liter per gram of lime or hydrate of lime, and 10 liters per gram of silicate of lime.

Second Factor. Carbonic Acid. Distilled water containing small quantities of carbonic acid, rain water, for example, will dissolve in the same way sulphate of lime upon which carbonic acid does not react. But it will dissolve free lime less completely because a part will be precipitated as a carbonate, and practically all the aluminates and sulphates will be rendered insoluble by carbonation. However, this carbonation tends slightly to increase the porosity of mortars.

Third Factor. Bicarbonate of Lime. Spring and rain waters contain soluble carbonate of lime which, because of the saturation of the carbonic acid, allows a neutral carbonate of lime to precipitate which slowly closes the pores of the mortar. Concrete reservoirs which may leak a little at the start finish by calking themselves completely. From this point of view, natural waters are more favorable to the preservation of mortars than those which are more calcareous.

Fourth Factor. Solution of Chloride of Magnesium. The magnesium is precipitated by lime and the chloride of calcium formed remains in solution. With artificial (portland) cement and hydraulic lime, with which free lime is formed during hardening, the magnesium is precipitated as a skin on the surface of the specimen. This was discovered by Vicat, and M. le Chatelier says he has verified it by using chloride of cobalt which has the similar effect. The deep blue produced did not go beyond the surface. The solution of lime at the surface tends to increase porosity somewhat; but still it would not be correct to call chloride of magnesium a destructive agent.

Fifth Factor. Sulphate of Lime. Sulphate of lime reacts with calcium trisilicate to form sulpho-aluminates. According to conditions, this may cause destructive swelling or it may cause hardening. The formation of hydrate of lime at the expense of uncombined anhydrite produces destructive influences, but the slower formation of hydrate of lime, at the same time, at the expense of tricalcium silicate produces hardening.

Action of Sea Water. The action of sea water on mortar and concrete is therefore very complex. At times it contains carbonic acid, favorable to hardening, chloride of magnesium, which has not much effect but tends to increase porosity, and the sulphates of lime and magnesium, which may tend to produce destructive swelling. All these reactions go on at the same time, and it is difficult to assign to each the part it plays in the final result.

Continuation of Highway Construction Is Entirely Justifiable

Probably Nearly 50% of Cement Output in 1932 Went Into Highway Structures as Against 20% in 1929

By J. L. Harrison

ALONE among the major fields which provide construction activity the highway field has not as yet been overbuilt. There are many ways of proving this. Some pertinent facts may be mentioned. For instance, only a little more than 250,000 miles of improved highway have been built on the state highway systems and less than half of this is high type construction. Another important fact is that the highway mileage included in the state systems has increased about as fast as unimproved mileage has been improved. This can only result from a very general desire for additional improvement of the standard maintained by the state highway departments. Gasoline consumption—indicating increasing use of existing highways—continued until about a year ago and even now, in the face of the worst depression in recent years—is still higher than it was in 1929!

It is of some importance that this condition be more widely understood. Eventually, no doubt, completed highway mileage and the demand for improved highways will be brought into balance. They are not in balance today, and it will require at least several years to bring them into balance if present rates of construction are continued. It is fortunate that this is the case for as most of the difficulties we are now experiencing are quite directly traceable to the fact that during the decade just passed too many men were drawn into the construction industry (and its many subsidiary ramifications); too much work done, and the doing of it too abruptly brought to a close. Our present situation would be much worse than it is if highway construction had also been or should be now abruptly halted.

The program of federal and state highway planning and construction at the close of 1932, together with state highway maintenance, was employing not far from 400,000 men. Most of these are married men with families so the number of those directly dependent on highway work for their livelihood cannot be much under 2,000,000 souls. If to these there are added those who work in preparing the materials of construction, processing them, transporting them and making the machinery and equipment that is used in connection with all of these operations, it is probable that the 1932 highway program supported not far from 1,000,000 workers—with their dependents some 4,500,000 to 5,000,000 souls. Ordinarily, county and municipal operations on roads and streets employ fully as many more. Operations in these fields have been much curtailed.

Cement for Highways in 1929, 20% of Output

In 1929 cement manufacturers marketed just short of 170,000,000 barrels of cement. During the same year the construction of concrete pavement on the state highway systems amounted to 6,991 miles. Pavements usually laid on a concrete base—principally brick, sheet asphalt and bituminous concrete—amounted to 656 miles. Cement, in quantity, was, therefore, used on the state highway systems alone in probably 7,500 miles of high type construction, some 27,500,000 bbl. of cement having been required in order to accomplish this work.

In addition to the cement required for this construction, a considerable amount was used in the construction of bridges, culverts and miscellaneous small structures. From such data as are available, it would appear that such uses absorbed about 3,000,000 bbl. In total the state highway program of 1929 then absorbed something more than 30,000,000 bbl. of cement, which is a little less than 20% of the reported shipments from American mills, a fact which indicates that while highway work contributed a valuable volume of business, it was not then the most important source of business.

During 1931, 9,664 miles of concrete pavement were built on the state highway systems, together with 161 miles of block pavement (principally brick) and 749 miles of bituminous concrete, pavements quite generally laid on a concrete base. In total, concrete slab plus concrete base must then have amounted to about 10,500 miles and must have used something over 40,000,000 bbl. of cement. During the same year, bridges, culverts and minor structures appear to have absorbed not far from 4,000,000 bbl., making the total amount of cement used in state highway construction during 1931 about 45,000,000 bbl. A little more than 127,000,000 bbl. of cement were shipped during 1931, of which state highway construction would appear to have absorbed nearly 40%.

In 1932 Highway Structures Took 50% of Output

Exact figures as to the number of miles of state highway built during 1932 are not yet available but estimates made a year ago indicate that concrete pavement and concrete base planned for construction during 1932 amounted to not far from 8,800 miles. The emergency relief funds made available by the Congress about the middle of the year stimulated highway construction with the result that it is probable that actual construction during 1932 exceeded 9,000 miles, or that including the cement required for bridges, culverts and miscellaneous small structures not much less than 40,000,000 bbl. of cement were used in state highway construction during the year just passed. Shipments of cement during 1932 were just a little over 80,500,000 bbl. During 1932, state highway construction has, therefore, absorbed practically an even half (50%) of the cement shipped. This would appear to indicate that the importance of state highway construction as a source of business for the cement industry and as a guarantee of employment to those attached to this industry has been increasing rather rapidly.

At the moment there does not appear to be much prospect of quickly reviving other lines of construction activity from which, in the past, the cement industry has derived the major portion of its business. The fields from which this business was derived have been overbuilt just as the cement industry itself is overbuilt, and it will take time—a good deal of it—for wear and tear, obsolescence and the normal increase in our population or some great new development, such as railroads and the automobile, to develop conditions favorable to any widespread building activity. On the other hand, as highways have not been built in excess, it is possible for some time to continue highway construction at currently prevailing rates and by so doing to prevent a further loss of business to the cement mills and the further unemployment of those attached to this industry which would inevitably result from any curtailment of activity in this the sole remaining major construction field in which normal activity is maintained.

George Bartlett Celebrates Seventy-Fifth Birthday

FORTY Chicago friends of George S. Bartlett, assistant to chairman of the Portland Cement Association, and one of the best known men in the cement industry, gathered at luncheon in the bungalow on the roof of the Hotel Sherman on Monday, April 3, to celebrate "George's" seventy-fifth birthday anniversary.

Those present included executives of several of the local cement companies and of the Portland Cement Association, and a few other friends of long standing. C. D. Franks of the Portland Cement Association presided.

A feature at the dinner on April 3 was an elaborate concrete birthday cake which defied the efforts of all who attempted to slice it.

An "Electric Fan" for the Crushing Plant

DURING the summer it frequently becomes so hot in the lower floors of plants that the men working around the crushers are in constant discomfort. A simple fan was rigged up on the ground floor of a Kentucky plant which kept the air circulating and the crusher room much cooler than it would otherwise have been.

To make this fan the driving gears of an old auto were used. The drive shaft, differential housing and gears and one half the rear axle of the car were mounted in a horizontal position on the timbers of the crushing plant structure about 6 ft. above the floor. An 8-in. wooden pulley was fastened on the axle where the wheel normally is, and a fan blade was fastened at the end of the driveshaft. The pulley was driven from the plant line shaft.

The fan can be made of stiff sheet steel. Two blades are sufficient, though four can be installed if desired. A guard should be placed around the fan to prevent men from walking into it.

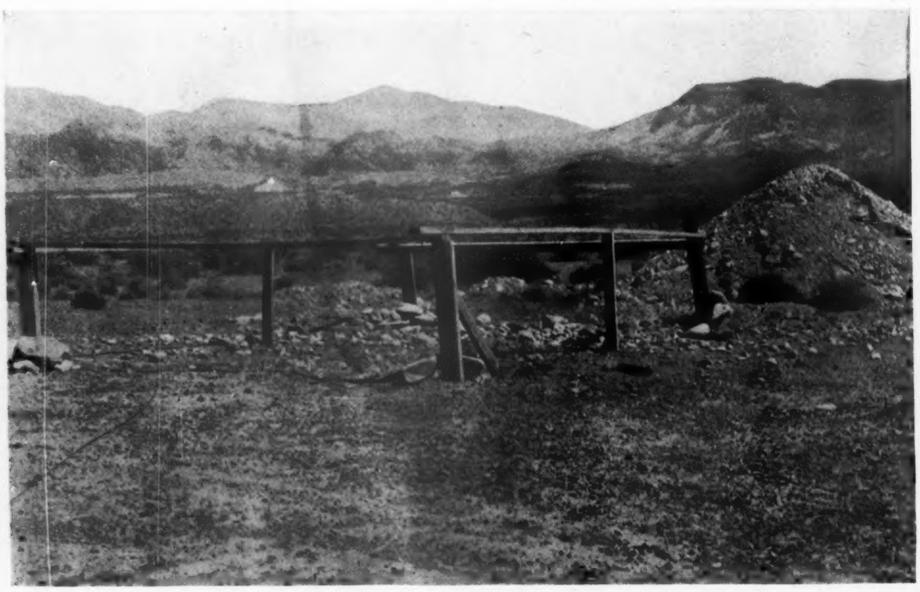
Sampling a Gravel Deposit

AT THE HOOVER DAM a good example of preliminary investigation for planning development of a sand and gravel deposit was set. Before erecting a plant various deposits in the district were carefully sampled and tested through a series of test pits.

At the site chosen for securing aggregate requirements for this project test pits ranging from 15 to 50 ft. deep were sunk. These pits were placed at regular intervals and systematically charted on a contour map so that the operators *know* the amount, character and depth of the entire deposit. There is no guesswork about it.

Incidentally, in this test work the gravel was found to contain from 6 to 7 c. of gold per cu. yd., according to local reports.

The illustration shows one of the pits with a fence to protect workmen from falling into it.

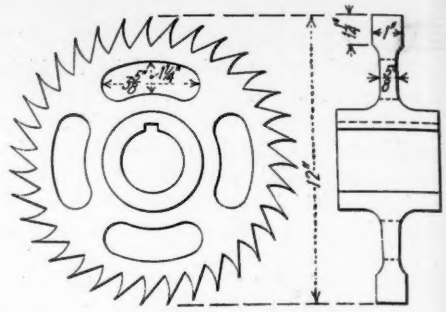


Sampling sand and gravel for Hoover dam

Removes Dirt from Shaft Sump with Saw-Tooth Impeller

CLEANING CHIPS and pieces of coal out of a sump at a shaft mine by installing a saw-tooth impeller in a centrifugal pump is outlined by E. C. Tillson, Cassity, W. Va., in *Coal Age.* This principle might find application in various rock products operations.

At the mine in question water was pumped 185 ft. up the shaft by a standard make 6-in. volute pump (inclosed double-suction impeller). Capacity was 1000 g.p.m. The presence of slack coal and chips in the mine water made it necessary to dismantle the pump several times a day to clean out the impellers. Strainers were employed, but these also clogged, usually when the water had reached the roof of the sump, so that it was impossible to get at them.



Saw-tooth impeller removes dirt from shaft sump

To clean out the sump, a saw-tooth impeller was made up as shown in the accompanying illustration. This was installed in the pump, and after most of the water had been removed, a man went in to agitate the fluid mass sufficiently to keep it running to the suction inlet. Chips and small coal were ground up in the pump and discharged. After the sump was cleaned out, the original impeller was replaced.

The saw-tooth impeller was sturdily constructed of brass with four holes in the web to allow the passage of water and thus eliminate end thrust by balancing the pump. Similar impellers can be cast at any brass foundry at a very low cost, Mr. Tillson remarks. Care should be taken to keep down the width of the vanes. Otherwise, it is likely that the motor will be overloaded.

Scrubbing and Rewashing Finished Gravel Product

IN A REPORT (U. S. Bureau of Mines, I. C. 6692) on "Mining, Treatment Methods, and Costs at the Western Indiana Gravel Co. Plant, Lafayette, Ind.," Dennis Dwyer describes a scrubbing and washing screen for a finished gravel product ¼ to 2½ in. in size, required to meet state highway specifications. The function of the screen and scrubber is to remove any adhering sand, but primarily to get rid of a yellow cast left after the original washing and screening operation.

Two new 60-cu. yd. capacity bins were built adjoining the main plant. The bins were of steel construction with wood floors and side walls, and were provided with bottom gates for car loading and side gates for truck loading. On the top of the bins a 40-in. diameter by 16½-ft. special scrubber screen was placed. This screen has an angle-type, bevel-gear drive with a 6-ft. scrubber

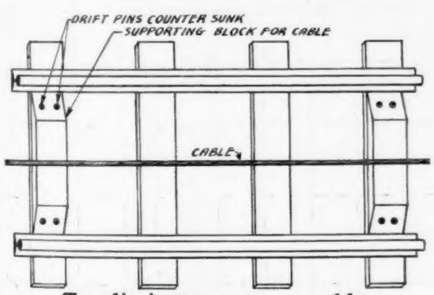
Supply station for sand and gravel trucks

section equipped with dams and lift angles. The rest of the screen is of perforated plate with ⅜-in. round holes and is jacketed by a screen with ¼-in. round holes. The screen has a slope of about 6 deg., uses 400 gal. of water per min., and has a capacity of 75 tons per hour. It is driven at 14 r.p.m. by a 10-hp., 1,200-r.p.m. motor. The scrubber section lasts about a year and the outer screen about 10 months. The rewashed pebbles from the screen are discharged into the bins underneath for loading.

Eliminating Wear on Track Hoisting Cable

By Dare Paris
Monrovia, Calif.

EVERYONE realizes the great amount of wear on the hoisting cable when it is left to drag between the rails, over rocks and through the dirt or, as frequently occurs, over steel rollers which have become stuck.



To eliminate wear on cable

The accompanying illustration shows a method of eliminating a great amount of this unnecessary wear. I find about the cheapest and best means of prolonging the life of the cable is to use pieces of discarded ties reaching the width of the track and spaced about 20 ft. apart down the center of the track. Drift pins are used to hold ties in place and should be countersunk.

Supply Station for Both Trucks and Drivers

WHEN Graham Bros., Inc., of Long Beach, Calif., built the neat and attractive oil station for serving its fleet of trucks another demand arose. This time the demand was by the truck drivers themselves. Since the yard was not near any store, they suggested that the caretaker of the station put in a stock of tobacco. Other suggestions followed and thus a small store was started at which candy bars, pop, cigars, cigarettes, gloves, etc., are on sale.

The store is maintained by Graham Bros., Inc., and the regular attendant at the service station attends to the wants of the driver or his truck.

Prospecting Sand and Gravel Deposits

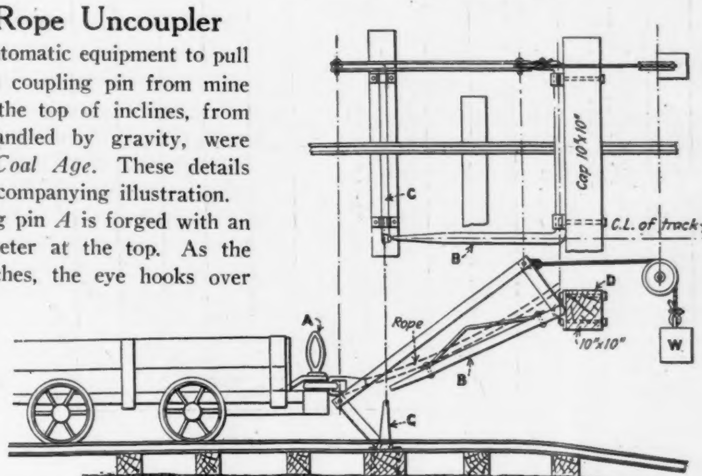
DENNIS DWYER, chief engineer of the Western Indiana Gravel Co., Lafayette, Ind., in Information Circular 6692, U. S. Bureau of Mines, describes the method of sampling or exploring his company's gravel deposit as follows:

The first exploration of the property was by open pits dug by hand. This method proved unsatisfactory on account of the cost and the limited depth attained. At present prospect holes are dug on contract at $1.50 per ft. The equipment used consists of a number of telescoping tubes approximately 3 ft. in diameter and 4 ft. long made of 12-gage steel. These tubes are put in place by the use of a steel tripod set directly above the hole and carrying a 1-in. manila rope run to a hand winch. One man works in the hole and one man on the surface. The material is loaded out and piled to one side on top. A depth of 50 ft. can be attained by this method. The prospect holes are placed in checkerboard fashion at 100-ft. intervals. An accurate log is recorded for each 2-ft. in depth and a screen analysis is made of the material from each hole after the hole is completed.

Automatic Rope Uncoupler

DETAILS for automatic equipment to pull the rope clevis coupling pin from mine or quarry cars at the top of inclines, from which they are handled by gravity, were recently given in *Coal Age*. These details are shown in an accompanying illustration.

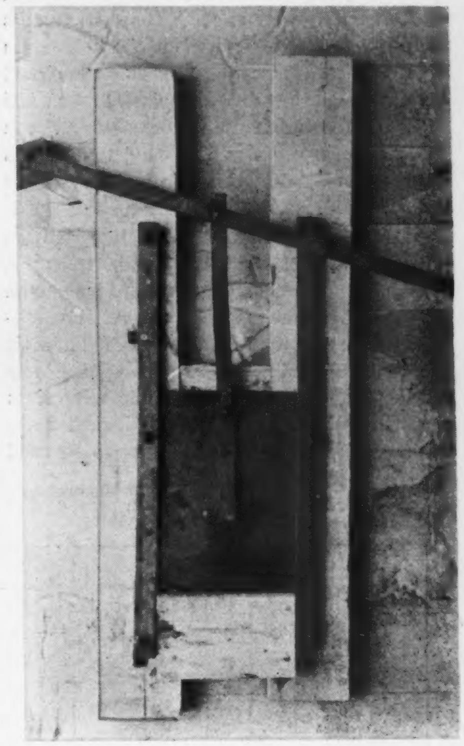
The rope coupling pin *A* is forged with an eye of 12-in. diameter at the top. As the empty trip approaches, the eye hooks over the projecting arm *B* when the car hits lever *C*, which in turn lifts *B* in a rapid motion and tosses the pin on to a platform above. After the trip of cars has passed the device resets itself by gravity.



Automatic cable uncoupler

Temporary Bin Gate

FOR TEMPORARY WORK a simple bin gate can be quickly constructed from strap iron and a metal plate. First the hole in the bin is edged by planks, as shown, and then two sets of strap iron pieces are screwed to the planks so that they form grooves



Strap iron is the chief material

through which the metal plate can slide. To accomplish this the outer strap must overlap the inner enough to hold the plate. Then a handle, pivoted at one end, is added and attached to the plate by a bar with bolts. The illustration shows the method of putting together the various parts.

Rock Products Clinic

Standardizing Sieve Openings

THE EDITOR: In your issue of February 25, you had an article dealing with wire diameters for screens used by the aggregate industry. In this connection, it appears to us that you might be interested in the method which we have developed for determination of the correct wire sizes for different screen openings.

By developing the formulae for the strength of the screen, its resistance to wear, and the percentage of open area obtained, and giving to each of these three factors its proper weight, we arrived at the conclusion mathematically that the wire diameter could be expressed by the formula $D = 0.225\ M^{3/4}$, but to give the most satisfactory values as checked in practice, we found that it was necessary to modify this formula to $D = 0.225\ M^{7/10}$.

In this expression D is the diameter of the wire and M the clear opening between the wires and the openings assumed to be square. By plotting the resulting curves on logarithmic paper, a perfectly smooth curve is obtained. The sizes of wire of course vary by steps, and by drawing in the wire sizes against these curves a definite logical basis for the selection of the size wire to be used in any screen is obtained.

We use two standards: one in screens for ordinary limestones, and a second for screens to be used with more abrasive materials, such as trap rock, granite and siliceous limestones.

We have standardized this method by drawing curves setting off the wire sizes, then checking the results by drawing the curves to show the open area obtained, and from these two curves, have selected the standard sizes that we use and which have proved to be very satisfactory in practice. All our wire sizes are based on the use of superior alloy wire materials as noted on our standard specifications, NA-107.

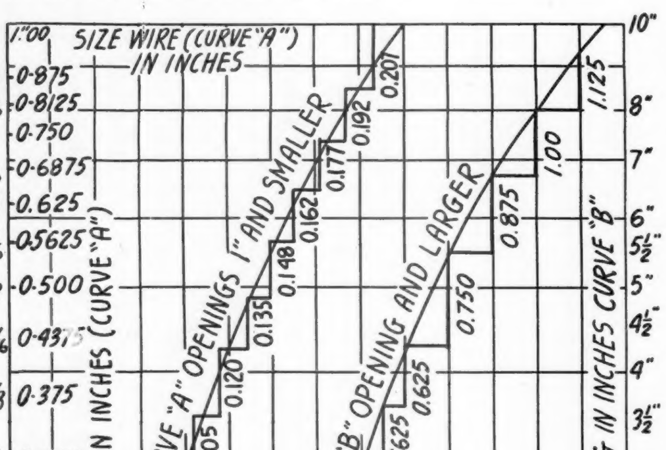
In this connection, we feel that we should not lose sight of the fact that the whole object of the screen is to produce the most perfect separations, and that the capacity of the screen depends entirely on the percentage of open area, and consequently too much weight should not be given to screen life, especially with vibrating screens where the cost of screen cloth for ordinary separations used in the aggregate industry is, in any case, a fraction of a cent per ton.

NATIONAL QUARRIES LIMITED,
R. M. SCRIVAUX,
Engineer.

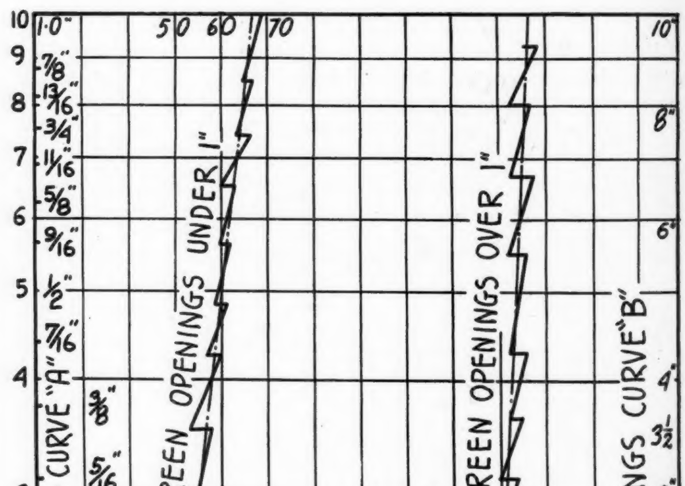
Montreal, Que.,
March 23, 1933.

NATIONAL QUARRIES, LTD.
SEPTEMBER STANDARD SCREEN SPEC.
NA-107—1932

Screen Opening in inches	Wire Dia. by Formula in inches	Standard Wire Diameter: Limestone in inches	Standard Wire Diameter: Trap, Granite, Etc. in inches
8	1.000	1⅛	1¼
7½	0.91	1	1⅛
7	0.82	1	1⅛
6½	0.825	⅞	1
6	0.798	⅞	1
5½	0.751	⅞	1
5	0.708	¾	⅞
4½	0.653	¾	⅞
4¼	0.625	¾	⅞
4	0.598	⅝	¾
3¾	0.570	⅝	¾
3½	0.541	9/16	⅝
3¼	0.508	9/16	⅝
3	0.485	½	9/16
2¾	0.454	½	9/16
2½	0.425	7/16	½
2¼	0.385	7/16	½
2	0.360	⅜	7/16
1¾	0.330	⅜	7/16
1½	0.298	5/16	⅜
1¼	0.270	¼	5/16
1	0.225	0.207	¼
⅞	0.205	0.207	¼
¾	0.184	0.192	0.207
⅝	0.162	0.162	0.192
½	0.141	0.148	0.162
7/16	0.129	0.135	0.148
⅜	0.114	0.120	0.135
5/16	0.100	0.105	0.120
¼	0.085	0.092	0.105
3/16	0.069	0.072	0.092
⅛	0.055	0.054	0.063
8-mesh	0.048	0.041	0.047
14-mesh		0.028	
20-mesh		0.020	



Curve showing relation of screen opening to size of wire



Curve showing screen opening and percentage of open area

Wire size shown under Limestone for non-abrasive rock and for feed not larger than 2½ times Screen opening. For larger feed or abrasive rock use wire size shown under Trap Rock. Wire material up to 3/16 in. Spring steel, Tyloy or Niagaralloy. Wire material up to ½ in. and larger Spring steel, etc., or Limestone, Manganese for Trap Rock.

An Exchange of Correspondence with Secretary Ickes on Cement Prices

Honorable Harold L. Ickes,
Secretary of the Interior,
Washington, D. C.

My dear Mr. Secretary:

The announcement in the *Chicago Tribune* of May 6 that you had ordered "action to defeat a 'cement trust,' charging a conspiracy to hold up the government itself" is rather surprising in view of President Roosevelt's informal talk before the Chamber of Commerce of the United States, and his more formal radio address to the people of this country last night.

If the President was correctly quoted he told the Chamber of Commerce of the United States:

"I present to you three requests. During the past few weeks we have witnessed with a slight but definite upturn in most industries a simultaneous rise on most commodity prices. Past experience indicates that when the price level begins to rise after a long period of declining commodity prices, wages which have been previously curtailed lag behind the rise in the price level.

* * *

"I therefore ask you, who represent in all probability the majority of the employers of the nation to refrain from further reduction in the wages of your employes, and I ask you also to increase your wage scales in conformity with and simultaneous with the rise of the level of commodity prices in so far as this lies within your power.

* * *

"My second request has to do with bringing order out of chaos. During the past four years, what previously had been considered to be an orderly industrial system has degenerated into one of the highest disorder. You and I acknowledge the existence of unfair methods of competition, of cutthroat prices and of general chaos. You and I agree that this condition must be rectified and that order must be restored. The attainment of that objective depends upon your willingness to cooperate with one another to this end, and also your willingness to cooperate with your government.

"In almost every industry an overwhelming majority of the units of the industry are wholly willing to work together to prevent overproduction, to prevent unfair wages, to eliminate improper working conditions. In the past success in attaining these objectives has been prevented by a small minority of units in many industries. I can assure you that you will have the cooperation of your government in bringing these minorities to understand that their unfair practices are contrary to a sound public policy."

The cement industry has attempted "to put its house in order," to accomplish the very things that President Roosevelt says all industry must do to save this country. For two or three years it has been steadily losing money because manufacturers have been trying to solve their problem by deflation and more deflation—by cutting wages and salaries to the lowest point in many years, by neglect of maintenance and repairs, by the elimination of dividends, and in some instances by attempting to avoid, by consent of bondholders, the payment of fixed capital charges. Yet there are still huge deficits to be met. In spite of this at least two of the cement companies did announce wage and salary increases simultaneously with the price increases.

Because now that cement manufacturers have had the backbone to meet this situation by the only method it can be met—by increasing prices to at least cover costs of manufacture—in line with what the President apparently wants every industrialist to do—you have berated them in public print.

Don't you think that before you charged the industry with unfair methods and threats of government competition, you should have done the fair thing yourself and investigated a little to see if the prices being charged, in spite of the fact that they are higher than last year's, are justified or not? An examination of the financial reports of the various companies would have convinced you that they have been selling cement for 20c to 50c a barrel less than it has cost to make it. The only way they could further reduce costs would be by a further slash in wages. Would you have them do this?

It seems to me, since the government is the principal purchaser of cement this year, if the administration is sincere in its professions of wanting to restore normal business conditions, it should be the last to complain about fair price increases. It seems very unjust and unreasonable to make a wholesale condemnation of the industry without attempting to find out whether these prices are fair or not.

I am for giving President Roosevelt and his administration a fair break in his experiments to improve business. I argued for his plans of "bold continuous experimentation" before he was nominated for the presidency. I believe he is on the right track. I believe we will not cure the ills of our present business depression under a capitalistic system of political economy unless business and industry are allowed to earn profits. Until then the government can derive no income from taxes on business, or on the incomes of business men. Until industry can earn a surplus, certainly there is no chance for increased wages, salaries, no chance for dividends, and no chance that normal expenditures will be made for badly needed replacements and rehabilitation. It is this failure of the industry to earn a surplus that is responsible for much unemployment in a thousand and one other industries throughout the country which serve the cement industry. Were the cement companies to turn their present deficits into surplus, buying orders for machinery and equipment would be placed rapidly with machinery plants, now shut down and idle.

It is not necessary for the manufacturers of a standard commodity to resort to collusion in order to arrive at a standardized price. Unless chaos exists, as described by President Roosevelt, the price of any standard commodity becomes the price made by the manufacturer so situated as to best supply the demand. Competitors must meet such a price, or get no business. If they cut this price in another's legitimate territory, that competitor will of course cut it in theirs; and as President Roosevelt rightly says, then you have unfair conditions, cutthroat prices and general chaos. It hardly seems logical that you, representing the government, are actually trying to force a return of such conditions on the portland cement industry, after three or four years of it, now that manufacturers themselves have seen the light and have the moral courage to face the issue.

Chicago, Ill., May 8, 1933.

Sincerely,
NATHAN C. ROCKWOOD.

* * *

Secretary Ickes' Reply

My dear Mr. Rockwood:

I have read your letter of May 8, and have noted your comments about the cement industry with interest. I may say in general that, of course, manufacturers of cement ought not to be expected to supply even the government without making a reasonable profit. To pay an excessive price for cement would not necessarily mean more employes in that industry or higher wages for the employes, in spite of your apparent assumption that this would be the result. Excessive prices might simply mean enhanced profits to the company itself, without improving the situation in the cement industry with respect to labor, and this would have the direct effect of holding down the amount of construction work with cement that could be done and thereby directly injuring labor.

I do not pretend to be an expert in the cement business. I do know that Illinois, and, as I understand it, Iowa and Indiana, have found it necessary to reject bids for cement for road building. I know also that this Department authorized the rejection of bids for cement for Boulder Dam. These are actual facts for what they may be worth, and these were the facts that I gave to the newspaper correspondents with the general comment, which I believe cannot be disputed, that the more money spent for cement, the less money spent for labor in working that product into public works.

Sincerely yours,

Washington, May 13, 1933.

HAROLD L. ICKES,
Secretary of the Interior.

Editorial Comment

Better Movable Plants

Use of aggregates from movable plants affects the entire aggregate industry, crushed stone and crushed slag no less than gravel. For, generally speaking, the cheapest aggregate that will pass specifications will be used on most jobs. And, while most movable plants are working sand and gravel deposits, movable plants to crush ledge rock outcrops are not uncommon in several parts of the country.

The growing use of the movable plant cannot be laid to the depression, except indirectly. The slowing up of general building and railway improvement, which began before 1929, increased the importance to producers of highway construction until instead of absorbing 25 or 30% of the industry's output it came to take nearer 75%. Moreover, early highway construction was near population centers where the large established plants could economically service the jobs. Highway construction the last two or three years has been farther and farther removed from population centers and established plants; and the growing mileage of paved roads has made it possible to service many of these jobs from new small plants more economically than from older large plants with long rail hauls.

Unless all signs fail, the condition described is not a permanent one. Construction projects of the near future are more likely to come from improvement of city terminal facilities (including approach and intra-city highways or streets) for railway, truck, bus and automobile traffic, elimination of grade crossings, etc., than from the improvement of country highways with anything more permanent than local gravel surfacing. Therefore the place of the large plant producing high grade material is not yet permanently endangered in any important economic sense by the newer, smaller type of operation.

If the movable plant is to survive it will *have* to produce just as good material as any other plant could produce from the same deposit. The difference is that there will be probably no storage facilities beyond truck loading bins, and hence the plant can be designed more compactly. This compactness combined with good engineering in other ways, including careful planning to take down or put up in sections, permits the plant to be moved from one deposit to another and erected with an expense that adds very little to the cost of the aggregate. It may be that not all such plants are now producing material of the same quality as permanent plants in the same locality, but they can be made to do so. And those who try to comfort themselves by saying that movable plant competition is only temporary because such plants cannot make really good materials are in the same position as the man who told Noah that he did not believe it would be much of a shower.

But neither the plant nor its products will be worth much unless the plant is well designed and strongly constructed. We have seen movable plants apparently designed solely with the idea of saving money. It takes just as much of a foundation to hold a crusher in a movable as it does in a permanent plant. Other details have to be just as large, belts have to be just as wide and just as well aligned and supported. Motors have to be just as well protected and the wiring has to be just as safe. In a word, details must be just as carefully looked after and be designed by just as competent a man as the designer of the largest and most permanent of plants. At the present time, the disposition seems to be for something too cheap. The buyer says "this is a kind of a temporary thing anyway, to tide over this depression," and the manufacturer says "the buyer will only look at the first cost anyway and I must get it low enough or somebody else will get the business."

Artificial Stone

For more than a century inventors have been almost continuously at work to make artificial stone. With the invention and development of portland cement the process was solved in a thoroughly practical manner, for a semi-liquid mixture of cement and aggregates can be cast in place or cast into building units, the finished product being for all ordinary purposes *stone*. Still many inventors and thinkers, especially those learned in geology, were not entirely satisfied. It is obvious that Nature forms rocks from semi-liquid components with far less expenditure of power or energy.

That the acid (silica, alumina, etc.) minerals would react chemically with the basic (lime, magnesia, etc.) minerals in the presence of steam was discovered when the sand-lime brick process was developed. Physical chemists have also long known that any mineral particles, fine enough, if brought into intimate contact, will coalesce or combine to form a solid. The problem has been to bring the particles into intimate contact, for air is always present even when the particles are pressed together under enormous pressures, and the particles surrounded by the thinnest film of air, or other gas, will not come actually into contact with one another.

A group of college professors has apparently solved the problem, as described on another page of this issue. Fine ground rock of almost any character mixed with lime and an alumino-silicate such as shale or slate and water after pressure of approximately 2,500 lb. per sq. in., have been found to react in a steam autoclave (like the steam drums used for sand-lime brick manufacture) to form a homogeneous, artificial rock, which can be molded or cast into any shape of building unit.

The product in manufacture is different from portland cement products in that all of the ingredients have to be ground to the fineness of portland cement. The product differs from a sand-lime product in that respect also. In both portland cement and sand-lime brick products the binder is largely a calcium silicate, while in this new product it appears to be an alumino-silicate of lime, with more of the alumina taking part in the reaction than silica. The major part of the ingredients, however, remain as inert aggregates.

Time for Plant Rehabilitation

AS THIS ISSUE OF ROCK PRODUCTS goes to press nearly every one in business and industry is attempting to estimate the results to him and to his business or industry as a whole of the "National Industrial Recovery Act," now before both houses of congress, at the President's solicitation. The ultimate effect of the proposed act may be so comprehensive and revolutionary that it is difficult to get any real grasp of its significance at first blush.

The act has really three entirely separate divisions: (1) regulation of all industry, largely through existing trade or industrial associations, under presidential supervision; (2) provision for expending up to $3,300,000,000 on public works, national, state, municipal and railway, under presidential supervision and approval; (3) a tax measure to provide funds for interest on and amortization of the necessary bond issue (not yet written into the bill as submitted to congress).

Under the provisions for construction of public works, the President is to appoint an "Administrator" and such other employes as he sees fit, without regard to civil service laws, as well as utilize other federal or state employes to carry out his plans. Public works, within the meaning of the act, are (*a*) construction, repair and improvement of public highways and parkways, public buildings, and any publicly owned instrumentalities and facilities; (*b*) conservation and development of natural resources, including control, utilization and purification of waters, prevention of soil erosion, development of water power, transmission of electrical energy, and construction of river and harbor improvements; (*c*) any projects of the character heretofore constructed or carried on either directly by public authority or with public aid to serve the interests of the general public; (*d*) construction under public regulation or control of low cost housing and slum-clearance projects; (*e*) any project (other than those included in the foregoing classes) of a character heretofore eligible for loans under the Reconstruction Finance Corporation Act; and army and navy construction work or mechanization if desirable.

To facilitate starting these construction projects the President is authorized and empowered to construct, finance, or aid in the construction or financing of any public-works project included in the above program; he may make grants of federal funds not in excess of 30% of the cost of labor or materials to states, municipalities, or other public works bodies for the construction, repair or improvement of any such project. Evidently this means that any other than a federal government project can not be financed to the extent of more than 30% by an outright grant or gift of federal money. But the rest of the amount may be borrowed, or obtained by selling the government bonds, apparently.

Highway construction is specifically provided for to an amount not exceeding $400,000,000. Three-fourths of this ($300,000,000) will be apportioned to the states in accordance with the provisions of the present federal-aid law, but the states will not be required to match the federal appropriation, as they are under the federal-aid law. The other one-fourth ($100,000,000) will be divided among the states in the direct ratio of population—in other words the few most populous states, New York, Pennsylvania, Illinois, Ohio, etc., will get nearly all of it. The character of the highway construction contemplated covers everything from city streets and grade separations to secondary or feeder roads with temporary surfacing. On all this highway work a 30-hour week, and minimum wages are to apply to those directly employed on the project.

This is more money for state highways, than ever has been expended in one year, it would seem. The federal aid used to be $80,000,000 a year with the states required to raise an additional $80,000,000. In 1932 an additional federal grant of $120,000,000 was made, making $280,000,000 available on all federal aid state highway construction. Besides the $400,000,000 provided in the present measure, some of the states still have undiverted gasoline tax funds, amounting to at least $250,000,000, in all probability.

The question uppermost in the minds of all Rock Products readers is probably: "How soon will all this start?" Robert D. Kohn, general chairman of the Construction League of the United States, who is reported to have had much to do with the inception of the proposed act, says that "the entire construction machine is nationally geared to go forward immediately with every phase of the program."

"The entire $3,300,000,000 authorized by the bill for public works construction can and should be obligated for sound projects before the end of the year, and the majority of the work actually underway within three to six months. In the case of highways, 80% of the $400,000,000 provided in the measure should be in the hands of the working man before the expiration of the present road building season. With the abundance of idle expert agencies in all phases of construction throughout the country, it is entirely possible and practical, and most desirable, to simultaneously start the whole program this summer," Mr. Kohn says.

If this is so, and we are inclined to believe that there is considerable basis for it, producers of rock products have not much time left to put their plants in a condition to produce satisfactory products. With the coming apparent shift in demand from materials for country highways to materials for city streets and public utilities, such as waterworks and sewage treatment plants, the characteristics of some of the products demanded may be quite different. If the work materializes with anything like the swiftness predicted, deliveries of equipment and machinery to rehabilitate plants are going to be slow.

Recent Quotations on Rock Products Securities

Stock	Date	Bid	Asked	*Dividend
Allentown P. C. com.[47]	5-18-33	4	6	
Allentown P. C. pfd.[47]	5-18-33	6	8	
Alpha P. C. com	5-23-33	14½	16	
Alpha P. C. pfd	5-19-33	66½	.....	1.75 qu. Mar. 15,'33
Amalgamated Phos. 6's, 1936[47]	5-18-33	91	94	
American Aggregates, com.[47]	5-18-33	1	2	
American Aggregates, pfd.[47]	5-18-33	10	12	
American Aggregates 6's, w. w.[47]	5-18-33	28	32	
American Aggregates 6's, ex. w.[47]	5-18-33	25	28	
American L. and S. 1st 7's[47]	5-18-33	33	36	
Arundel Corp. com[47]	5-22-33	10	11½	50c qu. Apr. 1, '33
Bessemer L. and C. Class A[47]	5-18-33	1	2	
Bessemer L. and C. 1st 6½'s[47]	5-18-33	15	17½	
Bessemer L. and C. cert. of dep.[47]	5-18-33	15	17½	
Bloomington Limestone 6's[47]	5-18-33	5	7	
Boston S. & G. new com.[37]	3-14-33	1	3	
Boston S. & G. new 7% pfd.[37]	3-14-33	10	20	1.75 qu. Jan., 3, '33
Boston S. & G. 7's, 1934[19]	3-14-33	50	60	
California Art Tile, A	3-18-33	½	1	
California Art Tile, B	3-18-33	.....	¾	
Calaveras Cement, com	5-16-33	1	4½	
Calaveras Cement, 7% pfd	5- 2-33	.....	70	1.75 qu. Apr. 15, '33
Canada Cement, com	5-18-33	5⅛ actual sale		
Canada Cement, pfd	5-18-33	25 actual sale		
Canada Cement 5½'s, 1947	5-16-33	70	72½	
Canada Crushed Stone bonds[42]	3-15-33	71½	.....	
Canada Crushed Stone, com.[42]	3-15-33	No market		
Certainteed Products, com.	5-18-33	3¼	3¾	
Certainteed Products, pfd	5-19-33	15	20	
Certainteed Products, 5½'s, 1948	5-16-33	44 actual sale		
Cleveland Quarries	5-18-33	.....	25	
Consolidated Cement 1st 6½'s A[47]	5-18-33	3	4	
Consolidated Cement, pfd.[47]	5-18-33	No market		
Consolidated Oka Sand and Gravel (Can.) 6½'s[12]	3-15-33	.....	35	
Consolidated Oka Sand and Gravel (Can.) pfd.[42]	12-27-32	.....	50	
Consolidated Rock Prod., com.[47]	5-18-33	10c	20c	
Consolidated Rock Prod., pfd.[47]	5-18-33	25c	50c	
Consolidated Rock Prod., units[47]	5-18-33	35c	75c	
Consolidated S. & G. pfd. (Can.)	1-16-33	.....	50	
Construction Material, com.[47]	5-18-33	10c	20c	
Construction Material, pfd.[47]	5-18-33	50c	75c	
Consumers Rock and Gravel, 1st Mtg. 6's, 1948[47]	5-18-33	15	17	
Coosa P. C., 1st 6's[47]	5-18-33	10	15	
Coplay Cement Mfg., pfd.[47]	5-18-33	5	8	
Coplay Cement Mfg. 6's, 1941[47]	5-18-33	40	50	
Dewey P. C. com.[47]	5-18-33	35	45	
Dolese and Shepard	5-22-33	6	8	
Dufferin Pav. & Cr. Stone, com.	5-15-33	1 actual sale		
Dufferin Pav. & Cr. Stone, pfd.	5-15-33	10 actual sale		
Edison P. C. com.[47]	5-18-33	1	3	
Edison P. C. pfd.[47]	5-18-33	3	5	
Federal P. C. 6½'s, 1941[47]	5-18-33	50	55	
Giant Portland Cement, com.[47]	5-18-33	2	4	
Giant Portland Cement, pfd.[47]	5-18-33	5	7	
Gyp. Lime & Alabastine, Ltd.	5-16-33	3⅜ actual sale		
Gyp. Lime & Alabastine 5½'s, 1948	5-16-33	39	41	
Hermitage Cement, com.[47]	5-18-33	5	7	
Hermitage Cement, pfd.[47]	5-18-33	25	35	
Ideal Cement 5's, 1943[47]	5-18-33	80	83	
Ideal Cement, com.[47]	5-18-33	12	12½	25c qu. Apr. 1, '33
Indiana Limestone 6's[47]	5-18-33	10	15	
International Cem., com	5-23-33	23½	23¾	
International Cem. bonds, 5's	5-16-33	71 actual sale		Semi-ann. int.
Kelley Island L. & T.	5-20-33	11	12	25c qu. Jan. 2, '33
Kentucky Cons. Stone, com.[47]	5-18-33	No market		
Kentucky Cons. Stone, 7% pfd.[47]	5-18-33	No market		
Kentucky Cons. Stone, 1st Mtg. 6½'s[47]	5-18-33	5	10	
Kentucky Cons. Stone, V. T. C.[47]	5-18-33	5	10	
Kentucky Rock Asphalt, com.	5-19-33	70c	85c	
Kentucky Rock Asphalt, pfd.	5-19-33	6½	10	
Kentucky Rock Asphalt 6½'s, 1935	5-19-33	53	55	
Lawrence P. C.	5-19-33	8	11	
Lawrence P. C., 5½'s, 1942[47]	5-18-33	32	35	
Lehigh P. C., com	5-23-33	15	16	
Lehigh P. C., pfd	5-16-33	51½	65	87½c qu. July 1, '33
Louisville Cement[47]	5-18-33	50	60	
Lyman-Richey, 1st 6's, 1935[47]	5-18-33	75	85	
Marbelite Corp., com. (cement pts.)	3-13-33	5c	50c	
Marbelite Corp., pfd	3-13-33	25c	.....	
Marquette Cement, com.[47]	5-18-33	8	8½	
Marquette Cement, pfd.[47]	5-18-33	39	42	1.50 qu. Jan. 3, '33
Marquette Cement Mfg., 1st 5's, 1936[47]	5 18-33	58	62	
Marquette Cement Mfg. 1st 6's, 1936[46]	5-22-33	80 (nominal)		
Material Service Corp.[47]	5-18-33	4	6	
McGrady-Rodgers, 7% pfd.[47]	5-18-33	30	40	
McGrady-Rodgers, com.[47]	5-18-33	5	10	
Medusa P. C. com.[47]	5-18-33	5	6	
Medusa P. C. pfd.[47]	5-18-33	30	50	
Michigan L. and C., com.[47]	5-18-33	52	56	
Missouri Portland Cement[47]	5-18-33	6	7	
Monarch Cement, com.[47]	5-18-33	35	50	
Monolith Portland Midwest[47]	5-18-33	½	1	
Monolith P. C., com.[47]	5-18-33	1	2	
Monolith P. C. pfd.[47]	5-18-33	1½	2½	
Monolith P. C. units[47]	5-18-33	2	3	
Monolith P. C. 1st Mtg. 6's[47]	5-18-33	50	55	
National Cem. (Can.) 1st 7's	2-21-33	70	80 (nominal)	
National Gypsum A com	5-22-33	2½	3¼	
National Gypsum pfd	5-22-33	45	47	1.75 qu. Apr. 1, '33
National Gypsum, 6's[47]	5-18-33	67	70	
National L. & S. 6½'s, 1941[47]	5-18-33	55	65	
Nazareth Cement, com.[47]	5-18-33	10	15	
Nazareth Cement, pfd.[47]	5-18-33	2	3	
Newaygo Portland Cement, 1st 6½'s[47]	5-18-33	30	35	
New England Lime 6's, 1935[14]	2-16-33	10 (nominal)		
New York Trap Rock 1st 6's	5-19-33	51 actual sale		
New York Trap Rock, 7% pfd.[47]	5-18-33	25	35	1.75 qu. Jan. 3, '33
North American Cement, 1st 6½'s[47]	5-18-33	7½	10	
North American Cement, com.[42]	5-18-33	½	1	
North American Cement, 7% pfd.[47]	5-18-33	2	5	
North Shore Material, 1st 6's[47]	5-18-33	30	35	
Northwestern States P. C.[47]	5-18-33	25	30	
Ohio River S & G, com.[47]	5-18-33	2	4	
Ohio River S and G, 1st pfd.[47]	5-18-33	25	35	
Ohio River S and G, 2nd pfd.[47]	5-18-33	10	15	
Ohio River S and G, 6's[47]	5-18-33	30	40	
Oregon P. C. com.[47]	5-18-33	5	10	
Oregon P. C. pfd.[47]	5-18-33	60	70	
Pacific Coast Aggr. com.[40]	3-13-33	.....	1	
Pacific Coast Aggr. pfd.[40]	3-13-33	.....	2	
Pacific Coast Aggr. 6½'s, 1944[5]	12-23-32	10	11	
Pacific Coast Aggr. 7's, 1939[5]	12-23-32	3	5	
Pacific Coast Cement 6's	5-22-33	29	32	
Pacific P. C. com	5-13-33	2.10 actual sale		
Pacific P. C. pfd	5-21-33	20½ actual sale		
Pacific P. C. 6½'s pfd	5-15-33	20	25	1.62½ qu. Jan. 5, '33
Pacific P. C. 6's, 1935[47]	5-18-33	82	85	
Pacific P. C. 6's, 1936	3-23-33	83	85	
Peerless Cement, com.[47]	5-18-33	30c	50c	
Peerless Cement, pfd.[47]	5-18-33	2	3	
Penn-Dixie Cement, com	5-23-33	4¾	5	
Penn-Dixie Cement, pfd	5-17-33	14½	20	
Penn-Dixie Cement 6's	5-16-33	55 actual sale		
Penn. Glass Sand Corp., pfd.[47]	5-18-33	35	40	
Penn. Glass Sand Corp, 6's[47]	5-18-33	75	80	
Petoskey P. C., com	5-19-33	90c	1.50	
Petoskey P. C. 6's, 1941	5-23-33	30	33	
Port Stockton Cement, com.[9]	3-18-33	No market		
Republic P. C. 6's, 1943	5-23-33	49	52	
Riverside Cement, A[47]	5-18-33	4	5	
Riverside Cement, B[47]	5-18-33	1	1½	
Riverside Cement, pfd.[47]	5-18-33	45	50	1.50 qu. May 1, '33
Sandusky Cement 6's[47]	5-18-33	25	35	
Sandusky Cement 6½'s, 1932-37[47]	5-18-33	35	45	
Santa Cruz P. C. com.[47]	5-18-33	50	55	1.00 qu. Apr. 1, '33
Schumacher Wallboard, com.[47]	5-18-33	1	2	
Schumacher Wallboard, pfd.[47]	5-18-33	3	5	
Signal Mt. P. C. pfd.[47]	5-18-33	5	10	
Southwestern P. C., units[47]	5-18-33	110	120	
Southwestern P. C. com.[47]	5-18-33	10	15	1.00 qu. Jan. 1, '33
Southwestern P. C. pfd.[47]	5-18-33	65	75	2.00 qu. Jan. 1, '33
Standard Paving and Material (Can.) com.[47]	5-18-33	50c	75c	
Standard Paving and Material, pfd.[47]	5-18-33	40	50	
Superior P. C., A[47]	5-18-33	25	30	27½c mo. May 1, '33
Superior P. C., B[47]	5-18-33	5	6	
Trinity P. C., units[47]	5-18-33	10	15	
Trinity P. C. com.[47]	5-18-33	1	2	
Trinity P. C. pfd.[47]	5-18-33	10	15	
U. S. Gypsum, com	5-23-33	36½	37	25c qu. July 1, '33
U. S. Gypsum, pfd	5-23-33	110½	112	1.75 qu. July 1, '33
Wabash P. C.[47]	5-18-33	4	5	
Warner Company, com.[47]	5-18-33	2	3	
Warner Company, 1st 7% pfd.[47]	5-18-33	15	20	
Warner Co. 6's, 1944, w. w.[47]	5-18-33	15	25	
Whitehall Cement Mfg. com.[47]	5-18-33	7	10	
Whitehall Cement Mfg. pfd.[47]	5-18-33	20	25	
Wisconsin L. and C., 1st 6's, 1933[47]	5-18-33	55	65	
Wisconsin L. and C., 6½'s[47]	5-18-33	55	65	
Wolverine P. C. com.[47]	5-18-33	1	2	
Yosemite P. C., A com.[47]	5-18-33	1½	2	

Quotations by: [5]Smith, Camp & Riley, San Francisco, Calif. [9]A. E. White Co., San Francisco, Calif. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [14]First Wisconsin Co., Milwaukee, Wis. [19]Hewitt, Ladin & Co., New York. [37]Wise, Hobbs & Arnold, Boston. [40]Martin Judge Co., San Francisco, Calif. [42]Nesbitt, Thompson & Co., Toronto. [46]Fir t Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill.

Financial News in Brief

Warner Co., Philadelphia, Penn., which did not pay April 1 interest on $5,840,000 first mortgage 6% sinking fund bonds, is proposing to security holders a financial reorganization plan.

The plan calls for a three-year waiver of fixed interest coupons maturing April 1, 1933, to October 1, 1935, inclusive, on the $5,840,000 bonds due in 1944. Such interest would be paid only if earned. Sinking fund would also be waived, company agreeing to apply 33⅓% of net earnings each year, available for dividends as a sinking fund for bonds.

Stated value of outstanding first and second preferred stock would be reduced by $5,379,550. Holders of 27,341 no par $7 first preferred would receive in exchange for each share one share of new $50 par first preferred stock and two shares of new common stock.

Holders of 53,500 shares of $100 par $7 second preferred stock would receive in exchange for each share, one share of new $25 par second preferred stock and 1½ shares of new common stock.

Holders of 234,242 no par shares of common stock would receive in exchange for each share, one-fifth of a share of new $1 par common stock.

The plan also calls for postponement of installments of principal due June 19, 1933, and December 19, 1933, on $205,500 "Arsenal" purchase money obligations until June 19, 1936, and December 19, 1936, respectively. Interest is to be payable at fixed rate of 5%. Provision is also made to extend principal payments over a 10-year period on the $205,000 purchase money obligations for capital stock of George A. Sinn, Inc., and $350,000 contract to purchase preferred stock of American Lime and Stone Co., a subsidiary.

At the annual meeting of the company four new directors were elected as follows: C. Q. MacDonough, E. H. Van Sciver, G. D. Van Sciver, J. H. Van Sciver. Directors reëlected were R. C. Bye, F. M. Hardt, W. C. Janney, G. P. Orr, H. G. Riter, J. L. Steele, J. M. Steele, A. D. Warner, Charles Warner, Irving Warner and J. S. Wilson, Jr.

The $7 cumulative second preferred stock received by the Van Sciver interests when the Van Sciver Corp. was consolidated with the Warner Co. had voting power at this meeting.

At meeting of directors for organization, Charles Warner was reëlected president and George D. Van Sciver was elected chairman of the board. Mr. Warner previously held both offices. A. D. Warner was reëlected vice president and treasurer and Charles Warner, Jr., was reëlected secretary.

COMPARATIVE INCOME ACCOUNT OF THE WARNER CO.

Period—	Calendar Years 1932	1931
Net sales	$3,821,286	*$9,021,101
Costs	3,184,565	6,285,423
Depreciation and depletion	700,897	1,018,258
Wholesale sales expense	157,179	240,229
Administrative expense	235,106	275,130
Prov. for credit losses	......	69,569
Discount allowed	151,173	324,381
Net profit	†$ 607,635	$ 808,110
Int. rec. fr. various sources	6,745	45,737
Discount earned	53,385	107,877
Gross income	$ 547,505	$ 961,725
Bond and other int. paid	403,452	434,110
Amort. of bond discount and expense	37,188	38,644
Prov. for Fed. inc. tax	......	17,699
Prov. for uncollectable notes and accounts	35,600	.....
Adjustments (net)	‡3,870	‡18,830
Net income	†$1,019,875	$ 490,102
First preferred dividends	48,643	193,753
Second preferred divs.	.....	381,500
Common dividends	.....	234,654
Balance, surplus	§$1,068,518	§$ 319,805
Shares of common stock outstanding (no par)	234,242	234,242
Earnings per share	Nil	Nil

*Gross sales. †Loss. ‡Cr. §Def.

Capital Surplus December 31, 1932.—Balance January 1, 1932, $386,636; surplus resulting from reduction of the stated value of common capital stock of no par value to $5 per share, $2,043,073; sundry adjustments (net), $4,267; total, $2,433,977. Deduct: Loss from property sold or abandoned, $267,005; loss from property revalued, $101,804; loss from worthless investments, $540,187; provision for fluctuation in investment values, $64,517; balance, December 31, 1932, $1,460,462.

Earned Surplus, December 31, 1932.—Balance January 1, 1932, $134,910; discount on securities redeemed, $61,349; cancellation of unrequired reserve for replacement of roads, $3,000; total, $199,259. Deduct: Net loss for the year ended December 31, 1932, $1,019,875; inventory adjustment, $15,000; unamortized bond discount and expense canceled, $11,463; dividend on first preferred capital stock paid April 1, 1932, $48,643; balance deficit, December 31, 1932, $895,722.

Notes.—(1) The payment due August 1, 1932, to the first mortgage bond sinking fund of an amount sufficient to purchase or redeem $100,000, principal amount, of bonds, was not made.

(2) The payment of $200,000 to the second preferred capital stock sinking fund, which was due in 1932, was not made.

(3) During 1932 the usual provision for depreciation was reduced 100% on inactive equipment and 50% on partially inactive equipment, or a total of $347,132. During the year 1931 a similar reduction of 50% on inactive equipment amounted to $152,347.

(4) At December 31, 1932, there were accumulated undeclared dividends as follows: On first preferred capital stock, $143,540; on second preferred capital stock, $374,500.

(5) No provision has been made in the 1932 statement for the Pennsylvania capital stock and corporate loan taxes for the year 1932, payable in 1933, which will amount to approximately $19,500.

(6) This statement does not take into account the company's share of the net loss for the year 1932 of controlled companies not consolidated, which amount to approximately $112,000.

CONSOLIDATED BALANCE SHEET OF THE WARNER CO. DECEMBER 31.

Assets—	1932	1931
Cash	$ 349,085	$ 246,991
Accounts and notes rec.	524,231	1,044,017
Inventories	499,744	710,489
Investments	784,254	1,035,280
Fire insur., workmen comp. and sinking fund	194,251	190,371
Prop., land mineral dep. and bldgs. equip. etc.	*14,463,358	15,680,018
Prepaid insurance, licenses, taxes, etc.	152,363	185,643
Bond discount and expense	416,586	465,237
Goodwill (purch. from other cos.)	52,250	......
Total	$17,436,122	$19,558,046
Liabilities—	**1932**	**1931**
Accts. payable	$ 38,089	$ 102,616
Dividends payable	......	144,376
Accr. Fed. inc. tax	......	17,699
Accrued int. and ground rents } Other accruals }	122,101	102,610
	......	21,216
1st mtge. 6% bds.	5,840,000	5,937,000
Other obligations	†1,359,500	1,152,600
Res. for fire insur., workmen's compensation and misc.	256,383	194,499
1st pref. stock	‡2,734,100	2,799,600
2d pref. stock	§5,350,000	5,350,000
Common stock	¶1,171,210	3,214,283
Capital surplus	1,460,462	386,636
Earned surplus	‖895,722	134,910
Total	$17,436,122	$19,558,046

‡Represented by 27,341 no par shares $7 pref. stock. §Represented by 53,500 no par shares $7 2d pref. stock. ¶Represented by 234,242 no par shares. *After depletion and depreciation of $7,461,529. †Purchase contract payable, maturing in 1933, $205,500; contract to purchase preferred stock of controlled company, maturing in 1933, $350,000; notes payable for purchase of capital stock of George A. Sinn, Inc. ($20,000 payable in 1933), $210,000; ground rent capitalized (annual ground rents $17,900), $335,000; purchase rental payable ($72,000 payable in 1933), $214,000, and mortgage payable maturing in 1934, $45,000. ‖Def.

North American Cement Corp., New York City, has submitted a financial readjustment plan to security holders, designed to reduce fixed charges from about $548,000 per year to $113,000. The present capital structure comprises $287,000 Acme Cement Corp., first mortgage 6%, due 1935; $5,814,500 sinking fund 6½% debentures (N. A. C. Co.) due 1940; 50,504 shares 7% cum. pref. $100 par stock (accum. div. to Mar. 1, 1933, $33.81 per sh.); 125,941 shares no par common stock. First mortgage bond holders would get new 6½% mortgage bonds of equal amount; debenture bond holders would get $250 in mortgage bonds and $750 in 6½% mortgage income bonds, per $1000 bond, and 10 shares of series B convertible prior preference stock in lieu of interest due March 1, 1933. For each share of preferred stock, with accumulated dividends, holders would get 2 shares of series A convertible prior preference stock. For each 100 shares of present common stock 15 shares of new shares, class A, would be issued. Under the proposed plan the new financial structure would be

6½% First mortgage bonds (due 1943)	$1,740,625
6½% Mortgage income bonds (due 1953)	4,360,875
101,108 shares, series A pref. ($1 par)	101,108
54,145 shares, series B pref. ($1 par)	58,145
18,892* shares, class A, com. ($1 par)	18,892
58,145† shares, class B, com. ($1 par).	

*119,900 shares authorized.
†Authorized but not issued.

The mortgage income bonds would be secured by a mortgage (subordinated to bank credits and subject to mortgage securing 6½% mortgage gold bonds) on all fixed assets. The convertible preference stock has preference as to assets and non-cumulative dividends of $2 per share; in liquidation entitled to $25 per share plus declared and unpaid dividends; callable at $25 per share.

Rock Products News Briefs

Sand and Gravel

ROYAL SAND AND CLAY CO., Chickamauga (near Jackson), Ohio, erected a plant for recovering molding sand in 1928. The plant has recently been sold to junk dealers—it never operated successfully.

♦ ♦ ♦

LOS ANGELES ROCK AND GRAVEL CO., Los Angeles, Calif., recently acquired several hundred acres of placer gold deposits in Tule Canyon, 39 miles from Goldfield, Nev., and is installing some of its cableway excavator equipment, prime movers, screens, etc., to handle 300 cu. yd. of gravel per 8-hour day for gold recovery. The company recently settled its claim against the City of Los Angeles for damages resulting from the city closing of its Arroyo Seco operations. The original claim was for $675,000; it was settled for $50,000.

♦ ♦ ♦

BUFFALO AND ROCHESTER, N. Y., sand and gravel producers are reported to have backed the Cilano law, recently signed by the governor, to require licensing and regulation of operators taking sand and gravel from lands of New York State under the waters of Lakes Ontario and Erie. Under the new law, the state land board, comprising the secretary of state, attorney general and superintendent of public works, is empowered to license and regulate the industry and may prescribe the terms and conditions under which the materials may be taken, including the amount of license fees.

♦ ♦ ♦

H. T. FARRELL, Plano, Tex., is reported to be developing a gravel deposit midway between Dallas and Fort Worth, on the Trinity River. The development includes 3 miles of railway to connect with the Rock Island railroad, near Tarrant. The total investment, it is said, will be $250,000. Jas. W. Williams, 610 Newell ave., Dallas, is engineer.

♦ ♦ ♦

BURBANK ROCK PRODUCTS CO., Burbank, Calif., was recently granted an injunction to prevent the city from interfering with its operation on condition that it screen its pit and plant with a row of trees, and not operate between 10 p. m. and 6:30 a. m.

♦ ♦ ♦

Slag

NATIONAL STEEL CO., Detroit, Mich., has announced plans for the erection of a new slag crushing and screening plant.

Cement

DEWEY PORTLAND CEMENT CO., Kansas City, Mo., is distributing a booklet, "The Dewey Masonry Manual," devoted to mortar cement, containing tables and other data.

♦ ♦ ♦

BOULDER DAM, Nevada, will require a cement blending plant to cost $125,000, on which construction is already well underway. This is the first cement blending plant ever installed on a construction job. The reason given is: "No two of the five mills supplying cement produces cement that is exactly alike in color and texture."

♦ ♦ ♦

NEW YORK CITY and metropolitan territory is again being flooded with foreign cement, according to numerous newspaper articles. It is said imports have increased 66% in recent months.

♦ ♦ ♦

UNIVERSAL ATLAS CEMENT CO. has begun shipments from its Hannibal, Mo., plant by barge on the Mississippi River. The cement is handled by the Burlington railroad from the plant to the river pier, where 400-ton barges take it to river points.

♦ ♦ ♦

ALPHA PORTLAND CEMENT CO., Ironton, Ohio, Frank Brownstead, superintendent, reports all but 24 of its 135 employes work their own garden plots. These 24 are to be offered plots on company owned land.

♦ ♦ ♦

MILWAUKEE, WIS., found the price for portland cement had advanced from $1.09 last year to $1.85 per bbl. recently, when bids were asked on 3,000 bbl.

♦ ♦ ♦

RICHMOND, VA., recently asked bids on 1000 bbl. of portland cement; price quoted $2.60 per bbl., net, 71c higher than last year's prices.

♦ ♦ ♦

GOVERNOR MURRAY of Oklahoma wants to divert a portion of the state gasoline tax to pay other state charges. Because he was informed portland cement interests were against this diversion the governor is quoted as saying: "If they institute suit (to test the validity of the diversion bill), I promise they will not get a dime for cement for the next two years."

♦ ♦ ♦

ASH GROVE LIME AND PORTLAND CEMENT CO., Louisville, Neb., on May 13 completed 1000 days without a lost-time accident.

BOTH HOUSES of the Illinois Legislature voted unanimously to allow the state to buy cement "in the open market"; after authorities had turned down three successive bids, which average $1.62 per bbl. delivered. The *Chicago Herald-Examiner* heads the news item "Cement Trust Dealt Blow"; which illustrates popular understanding of the whole controversy.

♦ ♦ ♦

GERMAN cement manufacturers made a 50% increase in prices recently. Present price is rm. 332 per ten-ton carload. Early in January the cement cartel in Germany cut prices from rm. 290 a carload to rm. 220, to combat activities of non-cartel producers in western Germany. The recent rise is laid to further cartelization in the industry. It is claimed that affiliation with the cartel has enabled numerous plants to remain in operation despite decreased consumption.

♦ ♦ ♦

Gypsum

UNITED STATES GYPSUM CO. has practically completed its new $250,000 wall board plant at Midland, near Blythe, Calif. This is only wall-board plant of the company on the Pacific Coast.

♦ ♦ ♦

UNITED STATE GYPSUM CO. has designated its Greenville, Miss., plant as its "Banner plant, division B" for the year 1932. The award is a blue and white banner to hang in the plant office, designating it "the plant whose operations have proved most beneficial to the company, based on safety of operation, quality of product, plant housekeeping, maintenance and costs." Judging by the amount of local publicity this means a lot to the company's employes. The Greenville plant manufactures "Red Top" insulating wall board.

♦ ♦ ♦

Lime

SANDUSKY LIME PRODUCTS CO., Toledo, Ohio., is a new corporation organized under the laws of Ohio to buy and acquire lime plants and promote the Ohio finishing lime business generally. L. E. Johnson, secretary of the Finishing Lime Association of Ohio, with C. V. Wolfe and R. H. Rogers are the incorporators; the latter two are attorneys. The company is capitalized at 5000 shares no par common stock. Apparently it is designed to act as a selling and holding company for Ohio finishing lime manufacturers.

Rock Products News Briefs

Crushed Stone

TIDEWATER STONE CO., Tarpon Springs, Fla., has about completed a new $35,000 crushed stone plant on the Seaboard Air Line R. R. The company was organized a short time ago by Leon F. Fernald, G. E. Moore, Tarpon Springs; E. J. Phillips, Alex Mayers, Clearwater, and Rex Farrior, Tampa.

♦ ♦ ♦

GENERAL CRUSHED STONE CO., through its Watertown, N. Y., operation, is reported locally to be backing a taxpayer's suit by a Wilna farmer to restrain the town of Wilna from selling crushed stone in the open market in competition with commercial stone. The town operates a quarry as an employment relief measure, but its charter does not permit it to engage in competition with commercial producers, it is alleged.

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CONSUMERS CRUSHED STONE CO., Racine, Wis., suffered a loss said to amount to $75,000 when a fire on May 15 destroyed a machine shop and engine house. Two standard-gage locomotives, a 50-ton and a 35-ton, were damaged.

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BINGHAMTON CRUSHED STONE AND GRAVEL CO., Binghamton, N. Y., Leon Boland, manager, is quoted: "Because of the good outlook for business and the way orders are coming in, it will be necessary for us to reopen with 25 men at once. We now have more orders than we have had for the last year and the coming season looks good."

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CEDAR RAPIDS, IA., city fathers insist on operating a municipal quarry over the protests of local contractors and building supply dealers. The city is employing 72 workmen quarrying and crushing stone on funds supplied by the Reconstruction Finance Corporation. Local contractors and building supply men contend stone can be bought for less money and the R. F. C. funds spent to better advantage. The city council refused to act on the suggestion. Other Iowa cities are said to be planning municipal quarries to operate on R. F. C. funds.

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DOLESE AND SHEPARD CO., Chicago, Ill., suffered an accident recently at its Hodgkins, Ill., quarry, in which three workmen were buried under a stock pile of limestone screenings. The men were operating a truck loader of the portable bucket conveyor type and were caught in a cave-in.

RIVERSIDE, CALIF., has discovered that it costs the city more than $1.55 a ton, the delivered price, to quarry and crush stone at its municipal plant.

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CEDAR FALLS, IA., is reported to have made a contract with a Cedar Rapids concern to quarry and crush 3000 cu. yd. of stone at a quarry leased by the city, for 50c. per cu. yd., the operators to furnish all machinery, labor and to stockpile the stone.

♦ ♦ ♦

NORTH CAROLINA INDUSTRIAL COMMISSION awarded a total of $17,150 to be paid the dependents of seven workers killed in a blasting accident at the quarry of the Blue Ridge Lime and Stone Co., Fletcher, N. C., a short time ago. In addition funeral expenses of $200 each were allowed. The Fidelity and Casualty Co. of New York was the insurer. All the workers came under the minimum wage provision and dependents are entitled to $7 per week for a period not to exceed 350 weeks. There were 20 dependent children in the families of the seven men.

♦ ♦ ♦

Silica

SILICA CO. OF CALIFORNIA, LTD., between Brentwood and Byron, Calif., is engaged in an expansion program to cost some $25,000. The new equipment will be for dry screening and includes new conveyors and bins.

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GEORGIA SILICA AND MINERAL CO., Etowah, Tenn., recently reorganized by John D. Parks, Etowah, and associates, has plans for a grinding plant to cost over $45,000.

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EASTERN SILICA AND CHEMICAL CO., Winchester, Va., a new company which completed an elaborate plant about two years ago, was offered for sale at public auction on May 19.

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Phosphate

AMERICAN POTASH AND SUPERPHOSPHATE CORP., Canal Bank Bldg., New Orleans, La., has recently been organized to erect a new plant near Crystal River, Fla., to cost about $175,000. It is reported the company will later build another plant near New Orleans. L. M. Turnbull is general manager and Joseph B. Gaffney will be engineer and general superintendent.

TENNESSEE rock phosphate plants are said to be showing considerable activity, due partly to plans for developing the Tennessee River valley and Muscle Shoals. The ultimate development of Duck River, the tributary of the Tennessee which traverses the heart of the Tennessee phosphate field, will give water transportation for millions of tons to farmers in the Tennessee valley, as well as furnish hydroelectric power for manufacture of concentrated phosphoric acid. General improvement in demand for fertilizer has been noted this spring because of better prices for farm products. Market prices of rock have shown no changes as yet, but probably are due for an increase soon. Completion and final satisfactory testing out of the new washing plant, recently installed by the largest independent operator, is reported; with results of outstanding importance.

♦ ♦ ♦

Magnesite

NORTHWEST MAGNESITE CO., Chewelah, Wash., will continue operations for at least another month, according to instructions received by Earl Garber, general manager, from the company headquarters at Pittsburgh, Penn. A sudden pickup in industrial lines in the East is responsible for the continued operation of the plant.

♦ ♦ ♦

Cement Manufacturers Discuss Silicosis

A FEATURE of the May meeting of the Portland Cement Association in New York City was a symposium on silicosis. Dr. Albert E. Russell, surgeon, U. S. Public Health Service, chief surgeon, U. S. Bureau of Mines, Washington, D. C., discussed "Silicosis and Other Pneumoconioses." Dr. Frederick H. Willson, Reading, Penn., talked on "Some Practical Aspects."

Other subjects discussed were "The Rational Planning of State Highway Programs," by Frank T. Sheets, consulting engineer, former state highway engineer of Illinois; "The Drive for Immediate Business—Housing, Modernizing, Etc.," by W. D. M. Allan, director of promotion of the association; "Cement-Bound Macadam—What We Learned from Our Yard-to-Yard Survey of Old and New Pavement," by J. R. Fairman, manager of the eastern office of the association; "Concrete — The Economical Pavement," by E. M. Fleming, manager of the highways bureau of the association, and "Monoliths in Concrete—Foreshadowing a New Era in Architecture," by W. E. Hart, of the association's Chicago staff.

TRAFFIC and TRANSPORTATION

Proposed Rate Changes

THE FOLLOWING are the latest proposed changes in freight rates up to the week ending May 31:

New England

29509. **Limestone, ground,** unburnt and broken, minimum weight 80,000 lb., except that when cars are loaded to cubical or visible capacity actual weight will apply.

To	Rockland, Me. Pres.	Rockland, Me. Pro.	Warren, Me. Pres.	Warren, Me. Pro.
Augusta, Me.	9	7½	..	..
Lisbon Falls, Me.	8	7	..	..
Livermore Falls, Me.	9½	8	..	..
Madison, Me.	10	9	10	9
Millinocket, Me.	14½	13	13	12½
Orono, Me.	11½	10	..	..
Rumford, Me.	10	9	..	..
Waterville, Me.	9½	8	..	..
Woodland, Me.	13½	12½	13	12½

29219. To revise rates on **crushed stone** and **crushed marble** (terrazzo aggregate), C. L., in bulk or in bags, in box cars (see Note 3), from Brandon and Middlebury, Vt., to New England, Trunk Line and Central Freight Association territories via all available routes on proposed basis of 17% of first class Docket 15879 rates.

610-3. To establish rates on **gravel and/or sand,** mixed with asphalt, oil and/or tar, the weight of the asphalt, oil, and/or tar mixture to be not more than 9% of the whole, and the percentage of the mixture to be specified on the bill of lading, in bulk, in gondola or other open cars, straight or mixed carloads (see Note 3) for joint haul movement within New England, on same basis as on crushed stone, when coated with tar, asphalt, oil or any bituminous binder as announced in Docket Bulletin No. 531 of Aug. 21, 1929.

Trunk Line

30682. **Sand** (other than blast, engine, foundry, glass, moulding and silica), and **gravel,** C. L. (see Note 2), from Springville, N. Y., to Smethport, Penn., $1.05 per net ton.

30903. **Limestone, unburnt, ground or pulverized,** C. L., minimum weight 50,000 lb., from Grove, Frederick, Security, Md., Engle and Martinsburg, W. Va., to Jersey City, N. J., 14c per 100 lb. (Present rate 14½c.)

30750. **Slag, crude or ground,** in bulk, C. L., (see Note 2), from Buffalo, N. Y., stations, East Buffalo and Harriet, N. Y., to stations on the N. Y. C. R. R., Presho, N. Y., Osceola, Westfield, Tioga, Wellsboro, Ansonia, Jersey Mills, Jersey Shore, Newberry Jct., Penn., and various. Rates ranging from $1.40 to $1.80 per net ton.

30751. **Sand,** C. L., minimum weight Scale 1, 60,000 lb., Scales 2 and 3 (see Note 2), from Hancock, Berkeley Springs and Great Cacapon, W. Va., to C. I. & L. Ry.

To	Scale 1	Scale 2	Scale 3
Adams, Ind.	$4.40	$3.60	$3.20
Bloomington, Ind.	4.20	3.40	3.20
Bedford, Ind.	4.20	3.40	3.20
Stinesville, Ind.	4.20	3.40	3.20

30844. **Gravel and sand,** N. O. I. B. N., in Official Classification, except **blast, engine, foundry, glass, molding, quartz, silex and silica,** carload, (See Note 2), from Netcong, N. J., to Bayonne, N. J. 94c per net ton subject to emergency charge, 1933; $1 per net ton, effective October 1, 1933. (Present rate $1.50.)

30849. **Gravel and sand,** N. O. I. B. N., in Official Classification, except **blast, engine, foundry, glass, molding, quartz, silex and silica,** in carloads, (See Note 2), from Netcong, N. J., to White House, N. J., $1, and Flemington, N. J., $1.20 per net ton.

30852. Group A, **crushed stone, plain, uncoated;** Group B, **crushed stone, with coating of oil, tar and/or asphaltum,** carloads, (See Note 2), from Janesville and Rock Cut, N. Y. Proposed rates to Fork Pond and Kildare, N. Y., Group A, $1.70; Group B, $1.80; Derrick to Spring Cove, N. Y., inclusive, Group A, $1.80; Groups B, $1.90; Santa Clara to Moira, N. Y., inclusive, Group A, $1.90; Group B, $2. Rates in cents per net ton.

30861. **Sand and gravel,** C. L., (See Note 2), from Whitings, N. J., to Flemington, N. J., $1.40 per net ton. (Present rate, $1.73.)

30867. **Stone, natural** (other than bituminous asphalt rock), **crushed,** C. L., (See Note 2), from Bowmansville, N. Y., to N. Y. C. R. R. (west) stations: Athol Springs, Westfield, N. Y., Erie, Penn., Frewsburg, N. Y., Warren, Pittsfield, Selkirk, Titusville, Penn., and various. Rates ranging from 60c to $1.20 per net ton.

30876. **Fertilizer Cortex sand** (silica or sand, including 15 to 20% of cork, mixed), carloads, minimum weight 30,000 lb., from Lyndhurst, N. J., to Philadelphia, Penn., 12c, Elkton, Perryville, Md., 15c, Aberdeen, Magnolia, Md., 16c, Baltimore, Md., Georgetown, Del., and Seaford, Del., 18c, Chestertown, Centreville, Queen Anne, Md., Harrington, Del., 17c, and Rehoboth, Del., 19c per 100 lb.

30785. **Ground limestone,** C. L., minimum weight 50,000 lb., from West Rutland, Vt., to Albany, N. Y., $1.15 per net ton local and $1 per net ton when for beyond by water (reduction).

30788. **Sand, carloads,** and **ground flint,** carloads, **from Hancock, Great Cacapon and Berkeley Springs, W. Va. Sand, blast, building, engine, glass, moulding** (see Note 3). **Ground flint,** 40,000 lb. from Gore and Triplett, Va., **sand, glass, other than pulverized** (see Note 3). **Sand, glass, pulverized or ground flint,** 40,000 lb., from Hancock, Berkeley Springs, Great Cacapon, W. Va., and Gore, Triplett, Va., to Wellsboro. Penn. Route—From Hancock, Berkeley Springs and Great Cacapon, W. Va., via B. & O. R. R.—Clearfield, Penn., N. Y. C. R. R. From Gore-Triplett, Va, via Winchester & Wardensville R. R.—Winchester—B. & O. R. R.—Clearfield, Penn.—N. Y. C. R. R. Proposed rate, from Hancock, Berkeley Springs and Great Cacapon, W. Va., building sand $2.50; engine, blast, glass, moulding, sand and ground flint, $2.75. From Gore-Triplett, Va., sand, glass, other than pulverized, $2.95; sand, glass, pulverized or ground flint, $2.95. Rates in cents per 2,000 lb.

30795. Cancel rate of 40c per net ton on **sand and gravel,** carload, from Lancaster, N. Y., to stations East Buffalo to Black Rock, N. Y., inclusive. Classification basis to apply.

30751. **Sand,** carload, minimum weight scale 1, 60,000 lb., scales 2 and 3 (see Note 2), from Hancock and Round Top, Md., to C. I. & L. Ry. Scale 1, to Adams, Ind., $4.40; Bloomington, Bedford and Stinesville, Ind., $4.20. Scale 2, to Adams, Ind., $3.60; Bloomington, Bedford and Stinesville, Ind., $3.40. Scale 3, to Adams, Ind., $3.20; Bloomington, Bedford and Stinesville, Ind., $3.20.

30814. (A) **crushed stone,** C. L., (B) **crushed stone, coated with oil, tar and/or asphaltum,** C. L. (see Note 2), from Jamesville, N. Y., to Ogdensburg, Knapps, Malone, Chateaugay, Ellenburgh, Altoona, Mooers, Champlain, N. Y., and various. (A) rates ranging from $1.60 to $1.90 per net ton and (B) rates ranging from $1.70 to $2 per net ton.

30824. **Stone, natural** (other than bituminous asphalt rock) **crushed,** carload (see Note 2), from Akron, N. Y., to Athol Springs, Lake View, Derby and Angola, N. Y., 80c per net ton. (Present rate 91c.)

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Central

35736. To establish on **crushed stone,** coated with oil, tar or asphaltum, C. L., from Bridgeport, O., to points in West Virginia and Maryland, rates as shown in Exhibit A attached.

To (Rep. Pts.)	*Proposed		
Glen Easton	96	Consolidation 37	176
Littleton	119	Century	176
Mannington	130	Belington	176
Grafton	142	Blue Creek	222
Cairo	153	Gassaway	188
Wilsonburg	142	Walkersville	188
Clarksburg	142	Midvale	188
Lost Creek	153	Elkins	188
Orlando	176	Hardman	153
Allingdale	211	Morgantown	153
Gaston	176	Masontown	153
Sage	176	Terra Alta	176
Alexander	188		

*In cents per 2,000 lb.
†In cents per 100 lb.

Rates will be subject to Tariff of Emergency charges.

35675. To establish on **stone, raw or crude, crushed, ground or pulverized,** C. L., in box car equipment, C. L., minimum weight 60,000 lbs., to Detroit, Mich., from Marblehead, Genoa, Martin and Luckey, O., rate of 140c per N. T.

35512. To establish on **crushed stone and stone screenings,** C. L., in open top equipment from East Brady, Penn., to destinations in the state of Pennsylvania west of a line drawn from Sand Patch, Penn., on the B. & O. R. R. to Cressen, Penn., on the P. R. R., thence due north to the Pennsylvania-New York State Line, rates on basis of the following mileage scale (in cents per ton):

	A	B		A	B
Under 20 mi.	60	80	100 to 125 mi.	110	130
20 to 40 mi.	70	90	125 to 150 mi.	120	140
40 to 60 mi.	80	100	150 to 175 mi.	130	150
60 to 80 mi.	90	110	175 to 200 mi.	140	160
80 to 100 mi.	100	120			

A—Single line. B—Joint line.

35819. To establish on **stone, crushed,** C. L., in bulk in open top cars (see Note 3), from Bridgeport, O.

To	Proposed Reductions N. T.
Washington, Pa.	80
Coffeys Crossing, Pa.	75
Vienna, Pa.	70
West Alexander, Pa.	65
Point Mills, W. Va.	60
Elm Grove, W. Va.	60
Littleton, W. Va.	80
Woodruff, W. Va.	75
Cameron, W. Va.	70
Glen Easton, W. Va.	65
Roseby Rock, W. Va.	60
Moundsville, W. Va.	60
Lang, W. Va.	60
Woodland, W. Va.	65
Graysville, W. Va.	65
Wells Pit, W. Va.	70
Steelton, W. Va.	75
New Martinsville, W. Va.	80
Paden City, W. Va.	80
Sistersville, W. Va.	85

35837. To establish on **sand and gravel,** C. L., from Lafayette, Ind., to Tefft, 90c; Wheatfield and Stoutsburg, Ind., 95c per N. T., plus emergency charge. (Reductions).

35807. To amend commodity description of **agricultural limestone,** published in agency and/or individual lines tariffs, in connection with rates between points in C. F. A. territory, also from points in C. F. A. territory to points east of the western termini of Eastern Trunk Lines, to read as follows: "Limestone, agricultural (raw, not burned or otherwise treated, crushed, ground or pulverized").

35818. To establish on **crushed stone,** in bulk only; **crushed stone screenings,** in bulk only; **tailings,** in bulk only; **agricultural lime, stone, unburned** (not ground or pulverized), in bulk in open top cars only; C. L., from Buffalo, N. Y., to Moorheads, Pa., rate of 90c per N. T., plus emergency charge. Present—100c, plus emergency charge.

35858. To establish on **stone, crushed,** and/or **gravel,** coated with oil, tar or asphaltum carload, from Chillicothe, O., to N. & W. Ry. stations east of Kenova, W. Va., to and including Williamson, W. Va., as shown in Exhibit A attached.

Route: Via N. & W. Ry. direct. Present, class rates.

35859. To establish on **sand and gravel,** carload, from Chillicothe, Ironton, Portsmouth, Sargents and Sciotoville, O., to C. & O. Ry. Dawkins Branch stations, also Wheelwright, Ky., rates as shown in Exhibit B attached Route: Via N. & W. Ry., Kenova, W. Va., C. & O. Ry. Present, class rates.

35872. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry glass grinding or polishing, loam or silica), carload, from Lafayette, Ind., to Kingman, Ind., rate of 90c per net ton plus emergency charge. Route: Via N. Y. C. & St. L. R. R., Oxford, Ind., and C. A. & S. R. R. Present rate, 100c, plus emergency charge.

Southwestern

777. **Silica sand,** from Denver group points to El Paso, Tex. To establish rates on Silica sand, carloads, of $3.48 per ton when in box cars and $3.20 per ton of 2,000 lb. when in open cars (see Note 3), from Denver group points, Denver, Colo., and south, to El Paso, Tex.

30763. **Crushed stone, coated with oil, tar,** or **asphaltum,** C. L. (see Note 2), from Snow Flake, W. Va., to stations on the C. & O. Ry. east of Gauley, W. Va., and to stations on connecting lines in trunk line territory. For single line haul rates ranging from 70c to $2.60 per net ton and for joint line haul rates ranging from 90c to $3.

30767. **Gravel and sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica) in open top equipment, carloads (see Note 2), from Erie, Penn., to Johnstown, Penn., $1.60 per net ton. (Present—$2.30.)

975. **Asphalt rock,** also **stone,** from Texas points to Illinois points. To establish a rate of $5.50 per ton of 2,000 lb. on asphalt rock, natural or coated, with not to exceed 5% of road oil, crushed or ground; **stone** coated, with not to exceed 5% of road oil, crushed or ground, in straight or mixed carloads (see Note 1), but not less than 50,000 lb. from Blewett, Cline, Dabney, LaPryor, Pulliam, Uvalde and Whitesmine, Tex., to Casey,

Lovington, Marshall, Paris and St. Jacob, Ill. (Present rate $6.30.)

1015. **Limestone, ground,** from Mosher and Ste. Genevieve, Mo., to Nashville, Tenn. To establish a rate of $3.19 per ton of 2,000 lb., on limestone, ground, carloads, minimum weight 10% less than marked capacity of car but not less than 40,000 lb., as to 139c of the rate and 60,000 lb. as to the remainder, from Mosher and Ste. Genevieve, Mo., to Nashville, Tenn. (Present rate $3.20.)

826. **Bituminous asphalt rock,** from Missouri points to East St. Louis, Ill. (destined beyond), carloads (see Note 3), to East St. Louis, Ill. (on traffic destined to points east of the Mississippi River), rates of 198c per ton from Deerfield, Eldorado Springs and Ellis, Mo., and 195c from Liberal and Nevada, Mo., and 192c from Harwood, Iantha and Lamar, Mo. These rates to expire December 31, 1933.

Southern

1386. **Sand and gravel,** carload, Norfolk, Petersburg, Puddledock and Hopewell, Va., to Interstate R. R. stations. It is proposed to establish commodity rates of 210c per net ton from Norfolk, Va., and 202c per net ton from Petersburg, Puddledock and Hopewell, Va., to Interstate R. R. stations, on sand and gravel, carload, (See Note 3), but in no case shall minimum weight be less than 90,000 lbs.

Texas-Louisiana

7034-4. **Crushed stone, etc.,** between points in Texas, on intrastate traffic: Proposition from carriers to extend the scale of rates shown in Item 2862, T. L. T. 2-L, beyond 800 miles, as follows:

Distances	Rates per Ton (S. L.)	(J. L.)
830 and over 800 mi..........	360	360
860 and over 830 mi..........	370	370
890 and over 860 mi..........	380	380
920 and over 890 mi..........	390	390
950 and over 920 mi..........	400	400
980 and over 950 mi..........	410	410
1,000 and over 980 mi..........	415	415

Illinios

7334. **Traffic-bound crushed stone and gravel** passing through one-inch screen, C. L., from Joliet and Chillicothe, Ill., to A. T. & S. F. Ry. station. (To representative points.)

	From Joliet, Ill.		From Chillicothe, Ill.	
	Pres.	Prop. No E. C.	Pres.	Prop. No E. C.
Millsdale, Ill. ...	‡63	50	..	..
Gorman, Ill.	‡76	50	..	..
Ransom, Ill.	76	50	75	50
Streator, Ill.	76	50	75	50
Leeds, Ill.	..	..	*75	50
Wilbern, Ill.	..	..	*50	40

(The above rates to expire Dec. 31, 1933.)

‡Traffic-bound gravel 39c plus 3.9c expires June 30, 1933.

*36c plus 3.6c expires June 30, 1933.

7273. **Sand, gravel** and **crushed stone,** from various producing points to C. & I. M. Ry., Taylorville and division stations. Representative rates.*

	From Pekin Proposed	From Lincoln Proposed	From Joliet Proposed
Pawnee, Ill.	88	88	113
Kincaid, Ill.	88	88	113
Taylorville, Ill.	88	88	113
Compro, Ill.	88	88	113

*Mostly increases.

7301. **Sand dust, carload,** minimum weight, same as applicable on sand, from Milwaukee, Wis., to Marseilles and Wilmington, Ill., rates per net ton. Present, $1.78; proposed, Marseilles $1.50, Wilmington $1.25.

Western

5319-G. **Sand, gravel and (1) stone, crushed,** C. L., minimum weight, regularly established minimum weights as provided in C. B. & Q. R. R. Tariff 16060-J, I. C. C. No. 18057, from Allis, Ashland, Fremont, Louisville, Oreapolis and South Bend, Neb., to Council Bluffs, Ia. Rates: Present—70c. Proposed—55c per ton, not to be subject to tariff of emergency charges. No switching charges to be absorbed. (1) Will apply on crushed stone only from Louisville, Neb.

1825-D. **Sand and gravel,** carload, usual minimum weight, from Eau Claire, Wis., to St. Paul, Minneapolis and Minnesota Transfer, Minn. Rates, present 5c per 100 lb.; proposed, 4c per 100 lb. rates subject to tariff or emergency charges.

1999C. C. L., usual minimum weight, from Mankato and Kasota, Minn., to Sioux City, Ia. Rates: Present—7½c per 100 lbs., plus emergency charge. Proposed—106c per ton, including emergency charge.

8414. **Sand,** viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, moulding or silica. (Rates in cents per N. T.)

From	Ottawa, Ill.		Browntown, Wis.		Muscatine, Ia.		Pacific, Mo.		Bowes, Ill.	
To	Pres.	Prop.	Pres.	Prop.	Pres.	Prop.	Pres.	Prop.	Pres.	Prop.
Kansas City, Mo..............	310	230	310	250	190	190	170	170	310	250
Twin Cities, Minn.............	240	240	200	220	220	220	320	320	240	240
Charles City, Ia..............	220	220	200	220	144	144	320	320	240	220
Omaha, Neb.	310	260	310	260	220	220	210	260	310	260
Cedar Rapids, Ia..............	180	180	240	180	85	85	310	310	240	180
Des Moines, Ia...............	230	230	290	230	133	133	320	320	290	230
Ottumwa, Ia.	220	220	250	240	106	106	290	290	250	240
Waterloo, Ia.	240	220	240	220	115	...	290	...	200	220
Ft. Dodge, Ia................	220	230	320	230	186	186	390	390	320	230

7383-E. **Limestone, agricultural,** carload, (See Note 3), in no case shall the minimum weight be less than 40,000 lb., from Atwood's Quarry No. 2, Mo. Proposed—To add Atwood's Quarry No. 2, Mo., a local point on the Wabash, as a point of origin in Item 1105-L, Sup. 71, W. T. L. Tariff 91-F. (By shipper.)

7383. **Limestone, agricultural,** carload, (See Note 3), in no case shall the minimum weight be less than 40,000 lbs., from Atwood's Quarry No. 2, Mo., South Liberty, Mo., to points in Missouri.

4781-M. **Rock, bituminous, asphalt,** C. L., (See Note 3), E. St. Louis, Ill., (on traffic destined to points east of the Miss. River). Present rates in cents per ton of 2,000 lbs.:

Deerfield	248	Iantha	242
Eldorado Springs ..	248	Lamar	242
Ellis	248	Liberal	245
Harwood	242	Nevada	245

Proposed—To establish rates as follows: From Deerfield, Eldorado Springs and Ellis, Mo., 198c per ton of 2,000 lb.; from Liberal and Nevada, Mo., 195c per ton of 2,000 lb.; from Harwood, Iantha and Lamar, Mo., 192c per ton of 2,000 lb. These rates to expire Dec. 31, 1933.

7383-D. **Limestone, agricultural,** less than carloads, in cartons, in barrels or boxes, or in bulk in bags, barrels or boxes, between stations in the state of Missouri. (Canceled from docket.)

5338-B. **Limestone, ground,** L. C. L., in cartons, in barrels or boxes, or in bulk in bags, barrels or boxes, between points in W. T. L. territory. Rates, present, fourth class; proposed, to provide an exception to W. T. L. Tariff 207-B, authorizing application of one and one-half times Class "E."

I. C. C. Decisions

25028. Coated Crushed Stone. Amiesite Corporation et al. vs. A. C. & Y. et al., embracing also a sub number, The Interstate Amiesite Co. vs. Same et al. By division 5. Interstate rates, crushed stone, coated with oil, asphaltum or tar, Pittsburgh and Casparis, Penn., and Cheektowaga, N. Y., to points in Pennsylvania, New York, Ohio, West Virginia, and Maryland on and west of an imaginary line extending north and south through Cumberland, Md., and Cresson, Pa., are and for the future will be unreasonable and unduly prejudicial to the extent they exceed or may exceed the rates prescribed on the same commodity in Interstate Amiesite Co. vs. A. C. & Y., 173 I. C. C. 456, at page 466. Further find assailed interstate rates from Martinsburg, W. Va., to destinations in New York, Pennsylvania, Maryland, West Virginia and Ohio on and west of said imaginary line, are and for the future will be unreasonable to the extent they exceed or may exceed rates a net ton as follows, subject to the conditions hereinafter set forth: Eighty miles and over 60, single-line, 113c; joint-line, 128c; 100 miles and over 80, single-line, 123c; joint-line, 137c; 125 miles and over 100 miles, single-line, 133c; joint-line, 146c; 150 miles and over 125, single-line, 143c; joint-line, 155c; 175 miles and over 150, single-line, 153c; joint-line, 164c; 200 miles and over 175, single-line, 161c; joint-line, 171c; 225 miles and over 200, single-line, 168c; joint-line, 177c; 250 miles and over 225, single-line, 175c; joint-line, 183c. Distances shall be computed over the routes composed of not more than three line-haul carriers, via existing connections for the interchange of carload traffic, which will result in the lowest rates, taking into consideration the joint line differential. Order for future effective on or before August 1. Present authorized emergency increases may be added.

Industrial Sand Cases

THE Interstate Commerce Commission has set June 16, 10 a. m., at the office of the commission in Washington, D. C., for further hearing of this long drawn out case No. 22907. Examiners Fuller and Hill will have charge.

THE Interstate Commerce Commission has put out a corrected order in No. 22907, Illinois Silica Sand Traffic Bureau vs. A. C. & Y. et al., and cases joined with it. In the order, as first issued, the Commission reopened the cases for further hearing as to rates for the future but said nothing about rates in the past and the question of reparation. In this corrected order are added No. 23575, Capstan Glass Co. vs. B. & O. et al.; No. 23097, Glenshaw Glass Co., Inc., et al. vs Same; No. 23382, Highland-Western Glass Co. vs. Same, and No. 21618, Gleason Works vs. N. Y. N. H. & H. et al. It repeated its order reopening the proceedings for further hearing on rates for the future. Then it added another ordering paragraph denying all other parts of the various petitions, "including the question of rates in the past."

Arkansas Rates Reduced

THE ARKANSAS CORPORATION COMMISSION has entered an agreement whereby the Missouri Pacific, Cotton Belt and Frisco railroads reduced the rate on gravel to be hauled to two highway construction and maintenance jobs. The conference resulting in the agreement was called by the commission several weeks ago and was attended by representatives of the highway department and the various railroad companies. The rate reduction of about 25% is applicable to 1,100 cars of gravel to be used on the jobs. Similar reductions for gravel hauls for several other jobs are under consideration, it was said. The reduction will be allowed only on road materials purchased by, consigned to and paid for by the state highway department, materials purchased by contractors not being affected.

I. C. C. Decisions

14880, Lime Fourth Section. Lime from Security, Md., to the south. By division 2. Southern carriers authorized, in second supplemental fourth section order No. 9639, to establish and maintain rates, lime, common, hydrated, quick or slack, from Security to points south of the Ohio and Potomac Rivers and east of the Mississippi River, the same as those contemporaneously maintained from Martinsburg, W. Va., subject to the limitations in the relief from Martinsburg, without regard to the long-and-short haul part of the fourth section.

Digest of Foreign Literature

By F. O. Anderegg, Ph.D.
Consulting Specialist, Pittsburgh, Pa.

Heat Transmission in Rotary Kilns.—11. Wm. Gilbert continues the discussion (cf. ROCK PRODUCTS, February, 1933, p. 50), of this subject by tabulating: (1) black body radiation for different temperatures, (2) radiation due to water vapor, (3) radiation due to carbon dioxide, (4) correction for the shielding effect of the moisture, and (5) radiation from burning pulverized coal. Data from these tables are required before any calculations on heat transmission may be made. *(To be continued.) Cement and Cement Manufacture* (1933), Vol. 6, No. 3, pp. 79-92.

International Dictionary of Cement. C. R. Platzman gives a list of technical terms applicable to the cement industry in English, French, German and Spanish. Those from A through E are given in *Cement and Cement Manufacture* (1933), Vol. 6, No. 3, pp. 93-96. *(To be continued.)*

The progress of the Pozzuolannic Reaction. The famous French concrete expert, R. Feret, has turned his attention to the pozzuolannic action of various siliceous materials that are being used on the Continent with lime or portland cement. He follows the reaction between the lime and silicate in the same way as Steopoe (ROCK PRODUCTS, March, 1933, p. 45) by dissolving in dilute HC1 and noting the increase in soluble silica, alumina and iron oxide and also obtaining the loss on ignition, on samples of mixed lime and silicate stored in water over different periods of time. The fineness of the pozzuolans is, of course, quite important in determining the amount of the reaction.

He also mixed a series of silicates with portland cement and sand graded from 0.5 to 10 mm. (0.02 to 0.4 in.) in the ratio 1:2:7, gaging to a constant consistency as determined by the penetration test, by the flow meter and by inspection. The compressive and flexural strengths were noted after 28 days and 3 months storage in water. For comparison, cement-sand mixes 2:7 and 3:7 were also made up. The finely ground pozzuolans required often a great deal of water, but on correcting for the variations in the water-cement ratio, it was definitely established that some improvement in strength was obtained owing to the pozzuolannic reaction. The silica soluble in dilute HC1 also increased with time, although the soluble alumina or iron oxide remained nearly constant.

The very fine grinding necessary for much activity being largely offset by the great increase in water requirement, the amounts that may be added to portland cements commercially are limited to 2 or 3% so that the pozzuolannic activity is negligible. This addition may be justified, however, to secure an increase in plasticity, in regard to which Feret remarks, "This question of the addition of plasticizers is quite complex; I have been studying it for a long time and shall be lucky if I can publish, some day, a general solution." *Revue des Materiaux de Construction et de Travaux Publics.* (1933), No. 281, pp. 41-44; No. 282, pp. 85-92.

The Chemistry of Portland Cement. Lennart Forsen has been working on the chemistry of portland cement and its reaction with water for several years in the Abo Academy and at the Lojo Lime Works at Gerknaes, Finland, assisted by F. W. Klingstedt, C. R. W. Mylius, K. A. Kvarnstroem and W. Mette. He uses the Werner coordination method of portraying complex inorganic compounds and makes many useful applications to the various compounds capable of being formed during the hydration of setting of portland cement. For instance, tracalcium aluminate may crystallize with 6, 12 or 18 moles of water which may be written as anhydride, $Ca_3[Al(OH)_6]_2$; the diaquo salt $[Ca(OH_2)_2]_3[Al(OH)_6]_2$; and the tetraquo salt, $[Ca(OH_2)_4]_3[Al(OH)_6]_2$, respectively. All three of these remain as the hexhydrate after drying in a desicator. In addition, $2\,CaO.Al_2O_3.7H_2O$ and $4CaO.Al_2O_3.13H_2O$, which change on drying to $5H_2O$ and $7H_2O$, respectively, are described. Tricalcium aluminate forms a series of double salts with other calcium salts including two with the sulfate, and one each with chloride, bromide, iodide, nitrate and chlorate. Two series of basic calcium salts are described, including $CaO.CaX_2.3H_2O$, which dries to a monohydrate, and $3CaO, CaX_2.15H_2O$, which dries to a trihydrate.

Among the calcium silicates occurs a well graded series ranging from tricalcium silicate, 3:1, Hillebrandite, 2:1, through Afwillite, 3:2 to Plombierite, 1:1. The hydration and hydrolysis of tri-silicate in portland cement may pass through this series, at least under certain conditions. Tricalcium silicate reacts very vigorously with aluminates and this is blamed for the flash setting of cements. The aluminate forms a protective coating around the silicate slowing down further hydration and preventing swelling the gel. When gypsum is present the insoluble double salt is precipitated and the silicate proceeds to hydrate and swell to form a gel.

The presence of calcium aluminate, 25%, added to 75% tricalcium silicate raises the compressive strength appreciably, while the addition of 5% calcium chloride to tri-silicate accomplished more than a doubling of the compressive strength. It is proposed that the basic chloride acts as nucleus for the formation of calcium hydroxide crystals, which are supposed to contribute to the strength. The calcium aluminates have a similar seeding action because of the similarity of their crystalling structures with that of calcium hydroxide. The cementing action is thought to result from the interaction of the silicate gel and the hydroxide crystals, which are supposed to form about nuclei of calcium aluminate or of basic calcium salts. *Zement.* (1933) Nos. 6, 7 and 8.

A more detailed account of the hydrates and double salts of the calcium aluminates is given by Forsen's colleague, Mylius in *Acta Academie Aboensis* (1933), Vol. 7, No. 3.

Quartz Silica in the Cement Raw Mix. Prof. Hans Kuehl of Berlin has studied the effect of the size of quartz grains in the raw mix on the degree of reaction, with the assistance of Bernhard Berkowitz. Using a clay so low in silica as to supply only two-thirds the requirement, quartz in different grain sizes was added. The mix was made in small balls, wrapped in platinum and burned in a platinum furnace under controlled conditions. When the quartz was finer than 100 microns the reaction was complete, with no insoluble residue or free lime, even at 1400 deg. C. Then quartz particles having a diameter of 0.33 mm. were found to be brought completely into combination in 20 minutes at this temperature, but the resulting clinker lacked the uniform appearance of the first set; holes were observed where the quartz particles had been, which were surrounded with dusted material. When the size of the quartz particles was increased to 1.07 mm. much larger holes were left in the clinker and these were surrounded with a considerable amount of dusted material which was colored more or less by the iron oxide which had not reacted. From the insoluble residue it was calculated that the depth of reaction on the quartz grains was 0.21 mm. so that a grain of 0.42 mm. diameter should be completely changed under these conditions.

To determine the temperature where the change takes place, a series of samples was made up with the 1.07 mm. quartz and placed in a furnace which was heated to 1100 deg. for 20 minutes when the first one was removed. The temperature was rapidly raised to 1200 deg. and another removed in 20 minutes. In the same way samples were removed at 1250, 1300, 1350 and 1400 deg. At the latter temperature, one sample remained 60 and another 120 minutes. In the first sample, heated at the lowest temperature, the quartz remained unattacked with 7.68% insoluble and 30.0% free lime. In the next one these figures had fallen to 4.28 and 29%, with evidence of attack on the surface of the grains. On examining the Rankin ternary diagram, a quintuple point, rich in silica, with a melting point of 1165

deg. is found which explains the initiation of the reaction observed. On further heating the insoluble and free lime fell slowly, until the temperature 1350 deg. was reached when both decreased rapidly. Another quintuple point is noted in the Rankin diagram at 1310 deg., which means the appearance of new melt to promote the reaction between silica and lime. It is necessary to have alumina present in order to get the benefit of these quintuple points. *Tonindustrie Zeitung* (19333, Vol. 57, No. 23, pp. 270-272; No. 25, pp. 297-299.

Comparative Experiments on the Effectiveness of Surface Waterproofers. The Chemical Laboratory for the Clay Industry in Berlin has made a series of tests on a variety of surface waterproofers, including two containing fluoride, three bituminous, four in various solvents, as well as a few integral waterproofers. Specimens 18x6x6 cm. were prepared and cured and coated on five sides, one end being left free. After standing for two weeks distilled water was brought in contact with the coated end and maintained at a height of 10 cm. for 8 hours. The fluo-compounds allowed considerable moisture to pass as did two of the solutions. The bituminous applications were satisfactory and also two of the solutions. Those specimens containing integral waterproofer showed little penetration. The free ends of the specimens were afterwards placed in contact with 2% sodium sulfate for 24 days and the appearance of efflorescence on the other end was noted. These results confirmed the permeability taste. *Tonindustrie Zeitung*, (1933), Vol. 57, No. 25, pp. 295-297.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Method of Making Portland Cement. The inventor first burns a composition that is like ordinary portland cement, except that it contains more lime than could be combined with the silica, alumina and iron present to form the ordinary portland cement compounds. The clinker is cooled and ground and to it clay is added to furnish the silica, iron and alumina needed to combine with the excess lime. Then it is burned again. It is claimed that a very high proportion of tricalcium silicate is formed in this way.

Example of the first mix burned is: CaO, 73%; MgO, 2%; SiO_2, 18%; Al_2O_3, 5%; Fe_2O_3, 2%. For each 1000 lb. of this there was added 60 lb. of clay with the following composition: SiO_2, 72%; Al_2O_3, 20%; Fe_2O_3, 8%. The corrected mix after burning had this composition: CaO, 68.86%; MgO, 1.89%; SiO_2, 21.06%; Fe_2O_3, 2.34%.—*H. H. Steinour, Assignor to Riverside Cement Co., Los Angeles, Calif. U. S. Patent No.* 1,856,442.

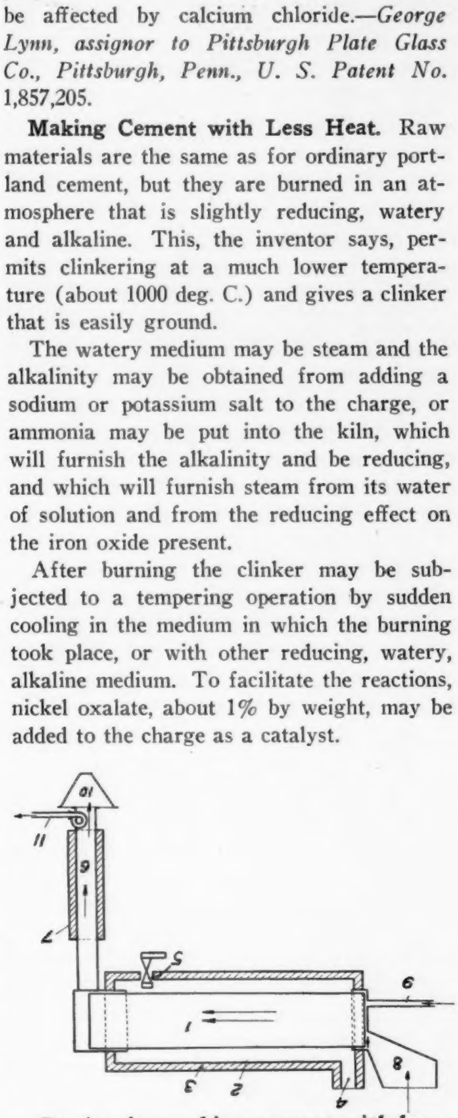
Cement for High Temperatures. The cement used is of the portland type in which the molecular ratio of Fe_2O_3 to Al_2O_3 is between 1:1.8 and 1:0.9 and in which the sum of the percentages of iron oxide and alumina is substantially the same as in normal portland cement. From 1 to 2½% of gypsum is added. The tricalcium aluminate should always be below 5% and below 3% if used for temperatures of 200 deg. F. or higher.—*Harold H. Steinour, assignor to Riverside Cement Co. of Los Angeles, Calif., U. S. Patent No.* 1,839,612.

Aluminous Cement. Patent covers the addition of about 1% of calcium chloride to a cement of the following composition: Alumina, 40%; lime, 40%; iron oxide, silica, magnesia, 15%; loss on ignition, 5%. The calcium chloride may be added dry, but is preferably added to the mixing water. The purpose is to make a cement that will not be affected by calcium chloride.—*George Lynn, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Penn., U. S. Patent No.* 1,857,205.

Making Cement with Less Heat. Raw materials are the same as for ordinary portland cement, but they are burned in an atmosphere that is slightly reducing, watery and alkaline. This, the inventor says, permits clinkering at a much lower temperature (about 1000 deg. C.) and gives a clinker that is easily ground.

The watery medium may be steam and the alkalinity may be obtained from adding a sodium or potassium salt to the charge, or ammonia may be put into the kiln, which will furnish the alkalinity and be reducing, and which will furnish steam from its water of solution and from the reducing effect on the iron oxide present.

After burning the clinker may be subjected to a tempering operation by sudden cooling in the medium in which the burning took place, or with other reducing, watery, alkaline medium. To facilitate the reactions, nickel oxalate, about 1% by weight, may be added to the charge as a catalyst.



Device for making cement with less heat energy

The apparatus includes a charge chamber (1) in a furnace (2) provided with a burner (5) and chimney (4). The gases for the reaction enter through the pipe (1). The clinker is discharged into the pipe (6) which is surrounded by a refrigerator (7). The spent gases are drawn off by the pump shown and recuperated.—*Veuve G. Lepine, née M. J. T. Roussel (France). U. S. Patent No.* 1,868,240.

Cement from Materials High in Magnesia. Inventor says that if calcining of ried to what he calls the third stage, any excess of lime will separate the magnesium silicate formed and combine with the silica. cement materials containing magnesia is car- The first stage is at 700-1200 deg. C., which converts the calcium carbonate to caustic lime. The second stage is at 1200-1450 deg. C., the temperature at which clinker is formed. The third stage is beyond 1450 deg. C. No upper limit is stated. The process is carried out in vertical kilns and only metallurgical coke can be used as fuel. The mix must contain enough lime to have a hydraulic modulus of at least 1.9. The final product may contain from 5 to 15% of magnesia.—*Karl Balthasar (Austria), Assignor of Four-Fifths to Richard Krause et al. of Vienna. U. S. Patent No.* 1,844,940.

Manganous Sulphate as Cement Retarder. Anhydrous manganous sulphate or any of its crystallized forms up to $MnSO_4 \cdot 7H_2O$ may be used in the place of gypsum, giving a greater control of the setting time of cement. It is effective in portions as low as ¼% and as high as 1½%, at which point the setting time is several times as long as normal. Such effect is pointed out as valuable in oil well cement and in cement used in ready-mixed concrete plants.—*H. McC. Larmour and S. C. Pierce, Assignors to Yosemite Portland Cement Co., Merced, Calif. U. S. Patent No.* 1,865,021.

Clinker Treatment. The inventors claim that if oxygen is kept from cement clinker while it is cooling a much superior cement is made, both the plasticity and the strength being greater than that of cement made from the same clinker cooled in the ordinary way. To insure absence of oxygen he adds some reducing substance, as oil, ground coke or sulphur. The cooling is carried preferably to below 400 deg. F. in this way.—*H. Larmour and S. C. Pierce, Assignors to Yosemite Portland Cement Corp., Merced, Calif. U. S. Patent No.* 1,859,926.

Refractory Product and Method of Making Same. The inventor claims that by adding glauconite to dolomite and firing the mixture at a high heat in a rotary kiln he obtains a material that has high refractory qualities and is stabilized against hydration and dusting. The mineral glauconite contains potash which assists in making a more mature and a more sound clinker, even though it passes out of the furnace at the high heat employed. *William J. McCaughey, Assignor to Basic Dolomite, Inc., Maple Grove, Ohio, U. S. Patent No.* 1,839,982.

Insulating Cement. An insulating cement for covering pipes, boilers, the outside of furnaces and the like is made of the following: Oiled mineral wool, 45-66%; diatomaceous earth, 10-30%; bentonite, 11-18%; asbestos, 5-20%.—*Horace N. Clark, assignor to Refractory and Engineering Corp. of New York, U. S. Patent No.* 1,851,038.

Missouri Producers Organize

ORGANIZATION was perfected at Jefferson City, Mo., May 9, of the Missouri Aggregate Association. The association has existed informally since last October when the contract was negotiated between the state highway commission, the railways and the producers, by which the railways granted a rate reduction to meet truck competition (see ROCK PRODUCTS, December 31, 1932).

Temporary officers elected were: John Prince, Stewart Sand and Material Co., Kansas City, chairman; Otto Conrades, St. Louis Material and Supply Co., St. Louis, vice-chairman; C. G. Cooley, Cooley Gravel Co., Chillicothe, secretary-treasurer. Besides these officers the directors are: R. Newton McDowell, Blackwater Stone Co., Blackwater; Earl Ray, Ray and Son Gravel Co., Louisiana; Ben Reynolds, Independent Gravel Co., Joplin; A. W. Wilkey, Wilkey Construction Co., Risco; R. N. Skrainka, Big Bend Quarry Co., St. Louis.

Dr. Otto Polysius

DR. OTTO POLYSIUS, head of the Polysius organization, Dessau, Germany, died May 4 after a long illness. Dr. Polysius has long been identified with the cement industry.

David Tod

DAVID TOD, president, David Tod Sand Co., died May 10, aged 85 years, at his home in Youngstown, Ohio.

Elmore Jerome Mitchell

ELMORE JEROME MITCHELL, Birmingham, Ala., president of the Southern Lime and Chemical Co., died April 28, aged 59 years.

Waller Crow

WALLER CROW, who for the past several years was engaged in special development work for the Dittlinger Lime Co., New Braunfels, Tex., died April 21. He will be remembered by friends in the lime industry chiefly as the secretary of the former Schaffer Engineering and Equipment Co., of about 1919-1924. As a partner of John C. Schaffer in developing and marketing the Schaffer continuous lime hydrator, and as a lime plant engineer, Waller Crow left a permanent mark in the history of the American lime industry.

Elected President of Lake Erie Limestone Co.

HOWARD B. CARPENTER has been elected president of the Lake Erie Limestone Co., a partly owned subsidiary of the Republic Steel Corp. Mr. Carpenter was formerly district superintendent of the steel company. He succeeds B. F. Fairless as director.

Sand-Lime Brick Production and Shipments in April

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Twelve sand-lime brick plants reported for the month of April, this number being three less than the number reporting for the month of March, statistics for which were published April 25:

Average Prices for April

Shipping point	Plant price	Delivered
Mishawaka, Ind.	$ 9.50	$ 8.75
Medford, Mass.	8.00	9.00-10.00
Syracuse, N. Y.	16.00	18.00
Flint, Mich.	11.50	13.00
Detroit, Mich.	....	11.50
Saginaw, Mich.	10.00	....
Milwaukee, Wis.	7.50	10.50
Madison, Wis.	12.50	11.00
Grand Rapids, Mich.	....	12.50
Dayton, Ohio	9.00	10.00
Toronto, Ont., Can.	12.00	13.50

Statistics for March and April

	†March	*April
Production	510,500	492,000
Shipments (rail)	14,500	50,000
Shipments (truck)	860,890	742,275
Stocks on hand	3,501,334	3,003,093
Unfilled orders	3,675,000	2,775,000

†Fifteen plants reporting; incomplete, five not reporting unfilled orders.
*Twelve plants reporting; incomplete, seven not reporting unfilled orders.

R. C. Muir Appointed Manager of Engineering

THE APPOINTMENT of Roy C. Muir, for three years assistant to the late Charles E. Eveleth, vice-president in charge of engineering, as manager of the engineering department of the General Electric Co. has been announced.

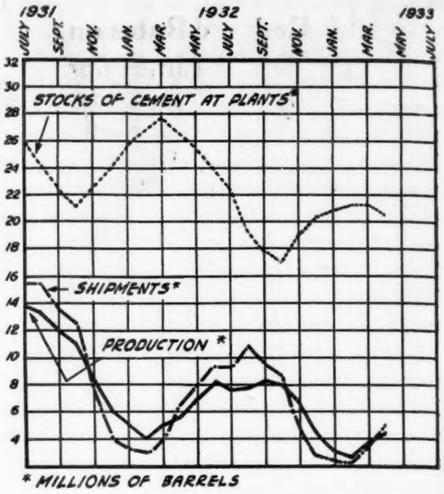
In his new capacity, Mr. Muir will have direct charge of the company's designing engineering in all of its various plants, the works laboratories, and the general engineering laboratory at Schenectady. He has been associated with Mr. Eveleth for three years and with the General Electric Company for the past 28 years, and his engineering experience covers a wide range of applications and developments, including three years as chief commercial engineer of the International General Electric Co.

Mr. Muir graduated from the University of Wisconsin in 1905 with the degree of B.S. in Electrical Engineering.

Following his graduation he entered directly the student engineering course of General Electric at Schenectady.

Rock Dusting Saves Lives

ROCK DUSTING is credited with saving the lives of 67 miners at the No. 1 mine of the Calumet Fuel Co., Delcarbon, Col. A mysterious explosion that killed one miner and seriously injured another is claimed to have been neutralized by rock dust.—*Coal Mining.*



* MILLIONS OF BARRELS

Cement Production, April

The portland cement industry in April produced 4,183,000 bbl., shipped 4,949,000 bbl. from the mills, and had in stock at the end of the month 20,532,000 bbl. Production showed a decrease of 23.6% and shipments a decrease of 24.3%, as compared with April, 1932. Portland cement stocks at mills were 22.5% lower than a year ago.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 164 plants both at the close of April, 1933, and of April, 1932.

RATIO (PER CENT) OF PRODUCTION TO CAPACITY

	—April— 1932	1933	March 1933	Feb. 1933	Jan. 1933
The month	24.8	18.9	16.1	13.4	12.9
The 12 months ended	41.7	26.2	26.7	27.1	27.6

Edgar D. Church

EDGAR D. CHURCH, 72, treasurer and general manager, Jackson and Church Co., Saginaw, Mich., died March 19.

Mr. Church became associated with John L. Jackson in 1893. In 1898 the firm of Jackson and Church was organized to take over the business of the MacGregor and Jackson Boiler Co. One of the principal products of this company was a sand-lime brick machine, in which industry the company has long been interested. Mr. Church patented a number of improvements for sand-lime brick machinery.

In addition to an active business life, Mr. Church has also been active in civic matters, having served as a member and president of the Saginaw police board, on the school board, and as director and president of the Saginaw Merchants and Manufacturers Association.

Erratum

IN THE ARTICLE describing the crushed stone plant of the Bethlehem Mines Corp., of Bridgeport, Penn., which was published in the March 25 issue of ROCK PRODUCTS, the fluid meter, which is used to measure the water consumed in washing, was shown in a wrong position. This illustration, on page 26, to be correct, should be rotated 90 deg. in a counter-clockwise direction.

Ask Reduced Rates on Agricultural Limestone

THE Midwest Agricultural Limestone Institute, of which E. J. Krause, president of the Columbia Quarry Co., St. Louis, Mo., is chairman, in co-operation with the Illinois Agricultural Association, the Indiana Farm Bureau Federation, the Iowa Farm Bureau Federation, the Missouri Farm Bureau Federation, and the Wisconsin Farm Bureau Federation, have petitioned the railways operating in these states for a 25% reduction in freight rates on agricultural limestone "as an emergency matter for the year 1933." The petition points out the decreasing use of limestone by the farmers the last three years, and the grave concern this neglect of soil fertility should cause every one. The loss of this business to the railways because of trucks is also emphasized.

Louisiana Appeal Granted

THE United States Supreme Court has granted an appeal from a decision of a special three-judge court last December, on petition of the Interstate Commerce Commission on application for increased intrastate rates or surcharges on sand, gravel, crushed stone and other commodities. The special court held against the I. C. C.

Lime in 1932

THE SALES of lime in 1932 by producers in the United States amounted to 1,956,000 short tons, valued at $12,108,000, according to estimates by the Bureau of Mines. This is a decrease of 28% in quantity and 35% in value compared with sales of 2,707,614 tons valued at $18,674,913 in 1931, and follows a decrease of 20% in quantity and 27% in value in 1931 compared with 1930. The average unit value per ton in 1932 was $6.19; in 1931 it was $6.90.

Small demand and lower prices were generally reported for all classes of lime.

Sales of lime in 1932 for construction are estimated at 666,000 tons, compared with 947,085 tons in 1931, a decrease of 30%. Sales of lime for chemical uses are estimated at 1,070,000 tons, a decrease of 27% from 1931. The sales of lime for agricultural use are estimated at 220,000 tons, a decrease of 26% in 1932 from 1931. All the states producing lime showed decreases from the 1931 production, ranging from 2 to 66% in quantity and 7 to 63% in value.

LIME SOLD BY PRODUCERS IN 1932

	1932 (estimated)		
	Total lime		Hydrated lime,
State	Short tons	Value	short tons
Ohio	477,000	$ 2,479,000	286,000
Pennsylvania	374,000	2,410,000	155,000
Missouri	180,000	1,082,000	76,000
Tennessee	104,000	454,000	27,000
West Virginia	85,000	446,000	34,000
Virginia	78,000	437,000	26,000
Illinois	76,000	547,000	17,100
Alabama	75,000	370,000	16,000
Massachusetts	64,000	466,000	24,000
Indiana	64,000	342,000	34,000
Michigan	42,000	301,000	10,400
Texas	35,000	286,000	23,000
Wisconsin	31,000	230,000	7,000
New York	29,000	229,000	11,500
Vermont	29,000	202,000	6,700
California	27,000	246,000	9,000
Maryland	25,000	160,000	16,000
Maine	23,000	183,000	(*)
Washington	17,400	175,000	(*)
Arizona	14,000	146,000	(*)
Other	106,600	917,000	62,300
Total	1,956,000	$12,108,000	841,000

*Included under "Other."

According to figures compiled by the Bureau of Foreign and Domestic Commerce there were 3579 short tons of lime, valued at $56,479, exported in 1932, and the general imports of lime (exclusive of dead-burned dolomite) amounted to 8777 short tons, valued at $96,035. These figures are subject to revision.

New Publications

Development of Sand and Gravel Deposits—Second of a series by J. R. Thoenen, senior mining engineer, Bureau of Mines, which discusses development of operation. Various methods of development for different types of deposits and equipment are discussed and illustrated by line drawings. An extended bibliography is given. Information Circular, 6689, United States Bureau of Mines, Washington, D. C.

Dredging Sand and Gravel in Oregon—Paper describes construction of Ross Island Sand and Gravel Co., dike between mainland and an island in the Willamette River, to protect a gravel deposit from river current. Information Circular, 6696, United States Bureau of Mines, Washington, D. C.

Concrete Floors—Two four-page folders discuss concrete floors, how to build them and give a specification for bonded concrete floor finish. Portland Cement Association, Chicago, Ill.

Clay in Concrete—Research paper 529 by D. A. Parsons has been reprinted from the February, 1933, issue of the Bureau of Standards Journal of Research, Washington, D. C.

Mining Treatment, Methods and Costs of the Consolidated Rock Products Co.—Information Circular 6607 describes methods of mining a sand, gravel and boulder deposit near Los Angeles, Calif., and the classification and separation of these materials for market. The description is typical of the industry in southern California. U. S. Bureau of Mines, Washington, D. C.

Mining Methods and Cost of Pacific Coast Aggregates, Inc.—Information Circular 6705 describes operations at the Eliot plant of the Pacific Coast Aggregates, Inc., near San Francisco, Calif. United States Bureau of Mines, Washington, D. C.

Cement Bound Macadam—Booklet gives history of cement bound macadam roads in both Europe and America. Recommended design and specifications are included. Portland Cement Association, Chicago, Ill.

Standards Yearbok 1933—Seventh edition of standardization annual is full of suggestions and data for all engaged in standardization. Bureau of Standards, Washington, D. C.

Examination of Eyes of Industrial Employes—Address by Dr. M. Davidson before the greater New York safety conference, outlines experience of industrial concerns with various eye surveys and a plan for examination of the eyes of workers. National Society for the Prevention of Blindness, New York, New York.

Mining Treatment, Methods and Costs at the Western Indiana Gravel Co.—Information Circular 6692 describes operations at plant No. 1, Lafayette, Ind., giving complete resume of this plant. Bureau of Mines, Washington, D. C.

Employes Handbooks—An analysis of subjects discussed in Employes Handbook to acquaint them with the ideas, methods and policies of an organization for which they work and to give them a complete understanding of the rules and regulations of the office; physical make-up of these books and the methods used to distribute them are described. Policyholders Service Bureau, Metropolitan Life Insurance Co., New York, N. Y.

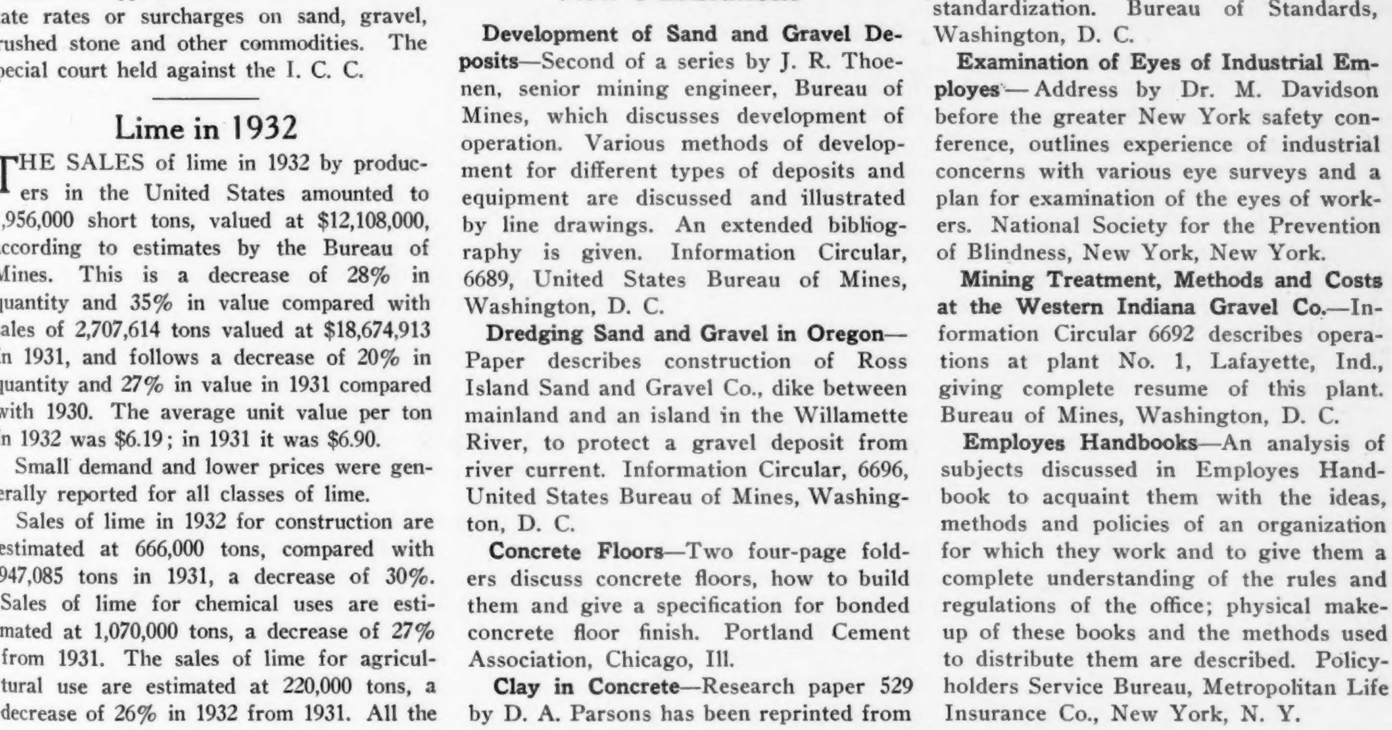


Chart showing five-year course of sales of lime in United States

Cement Products
TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Rostone, a New Building Material

Process Utilizes Lime, Quarry Waste and Shale

SYNTHETIC building stone composed of shale and quarry refuse, with many of the characteristics of natural cut stone and with a flexibility in design and use that will permit its use in structures of all types and sizes, has recently been announced through the American Chemical Society.

Rostone, as it is known, is the result of research work of David E. Ross, Prof. H. C. Peffer and Richard L. Harrison, of Lafayette, Ind. It is composed of finely divided particles of shale, lime and stone, molded into any desired shape under pressure and steam treated, after which it is immediately ready for use. The entire process requires less than a day's time, from quarried stone and shale to finished product, including necessary curing.

Knobstone shales (Lower Mississippian) of western Indiana have been utilized for the most part in the work described, but other products containing alumino-silicates have also been successfully used, such as shales and slates from other and widely separated sections of the country.

Typical analyses of these silicates are given in Table I:

TABLE I

	Knobstone shale Percent	Illinois shale Percent	Vermont shale Percent
SiO_2	75.3	62.02	60.03
Al_2O_3	10.62	23.78	14.28
Fe_2O_3	5.25	5.22	5.07
CaO	1.18	1.42	3.93
MgO	1.58	1.60	6.35
K_2O	2.40	0.23	
Na_2O	0.34	0.38	
Loss at 110 deg. F.	0.91	1.15	0.19
Loss on ignition	4.23	6.16	6.69

With the shale is mixed finely ground stone, such as limestone, granite, marble, slate or other alkaline earth base stone.

Illustrating the method and process of manufacturing a new artificial stone, finishing the products, and some uses of the product

Process

The sequence of operations in the production of Rostone is as follows: The shale or other alumino-silicate is ground to a fineness of 90% through 325-mesh in the dry state, with a large percentage of 15 to 40 micron size. Reduced to this degree of fineness, these materials are highly reactive chemically probably due to the increase in surface between reacting solids. The finely ground material is thoroughly incorporated with completely slaked calcium hydrate (lime) in an ordinary wet pan with revolving mullers and scraper blades. This has been found to give the thorough incorporation which is essential. While mixing a specific proportion of water is added slowly to form a damp mass, which for the Knobstone shale and lime mix, amounts to 18 to 22% by weight.

The moist powder is then compressed at a pressure of 2500 lb. per sq. in. in polished steel molds to the shape desired. The molded piece is then allowed to stand for one or two hours to permit any internal moisture differential to adjust itself. If it is allowed to stand very long in the open air under room temperature conditions the chemical reaction starts slowly and, if there is no loss of essential reacting water, an increasing hardness can be observed after a few hours.

After standing for a short period upon removal from the presses, complete reaction

is brought about by autoclaving with saturated team at low pressure.

The eaction caused is completed with disappearance of the lime and, to some extent, of the alumino-silicat. Absence of the lime is indicated by negative results from the ammonium acetate and phenol phthalein tests as well as absence of the characteristic lines in the X-ray pictures. Likewise the X-ray shows partial disappearance of the alumino-silicate.

It is essential in the indurating (steaming) reaction that the necessary reacting water in the mass be held within narrow limits, which are characteristic for a given shale or slate. If an excess of water is present, the mass crumbles or disintegrates; a deficiency results in a weak, chalky product. In either case, a material of no structural value is the result. To complete the reaction in large pressed bodies requires about two hours in the autoclave. The material is then allowed to cool for about an hour before removal to the open air.

Upon removal from the autoclave the material has its ultimate strength, and no further curing is necessary. Various surface finishes can be added to suit the requirements, such as highly polished, dull polished, or natural stone.

In the pressing operation, internally threaded studs, or thimbles, with enlarged heads are placed on pins in the base pallet, which, when the unit is completed, permit fastening to steel uprights forming the framework of the structure.

Analysis and Composition

On first inspection it might be thought that the reactions involved were similar to those of sand-lime brick. However, the petrographic analysis of the Knobstone shale shows the presence of only a relatively small amount of free silica. X-ray analysis indicates that a new compound has been formed as a result of the reaction. The presumption is that the reaction product is a hydrated calcium alumino-silicate of new composition and properties. The X-ray reveals absence of the original alumino-silicic acid and the lime in the final product, but does show that silica, dolomite and other common ingredients of the original shale remain inert during the process. The X-ray likewise indicates that the alumino-silicic acid reacts in preference to the free silica present, which is probably due to the shorter time of reaction and the lower temperature of reaction than is utilized in obtaining a silica lime product.

A micro-crystalline mass in which the crystals or particles present are smaller in size than the crystals or particles in present-day portland cement is also shown. Coarsely ground shale such as that retained on a 48-mesh sieve shows very little reaction, and gives an unsound product. Rostone exhibits considerable resistance to cold dilute acids and to a boiling solution of sodium carbonate, both of which attack the calcium aluminates.

Practical Use of Rostone

The strength that it is possible to develop in this new material enables it to be used alone or as a matrix to bind together other materials, so that in many instances materials that are now waste can be used successfully, and even in certain cases materials that are an expense to get rid of. This includes waste accompanying the quarrying of marble in Vermont and Tennessee, granite of the New England States, Georgia, Missouri and Colorado, and limestone in Indiana.

In the case of all these materials, the mass takes coloring matter without difficulty, making it suitable for either exterior or interior use. The coloring mineral added to the matrix colors the entire mass and a large range of beautiful shades may be obtained. Due to the completeness of the reaction between the base and the alumino-silicic acid, there remains in the Rostone either no trace or a very small trace of free base; consequently these colors remain permanent. All these colored synthesized stones have been subjected during the past five years to natural weathering conditions such as prevail in the hard Indiana winters, both on the ground and on the roofs of buildings; in addition, artificial tests have been employed utilizing the ultra-violet ray and water, and no change of color tone on the tested samples has been discernible when compared with control samples.

By manipulation of the mix in charging the mold, variegated as well as colored veneered shapes and finishes can be obtained.

Properties

A typical formula, giving proportions by weight, which has been used, follows:

16.7 parts shale
10.0 parts calcium hydroxide
5.3 parts water
68.0 parts limestone aggregate

The product of the reaction between Knobstone shale and hydrated lime shows a fine waxy texture. As normally produced it will exhibit a compressive strength of 10,000 lb. per sq. in.; compressive strengths up to 22,000 lb. per sq. in. have been attained.

Rostone, with the typical formula given above and using limestone aggregate, will have the following properties:

Compressive strength per sq. in....	6,000 lb.
Flexure: Modulus of rupture, per sq. in.	1,500 lb.
Absorption: 5 hr. immersion at 70-75 deg. F.—dried at 200 deg. F.	9%
Dorry hardness: Coefficient.......	8.0
Toughness	7-8 cm.

A fire test was made wherein one side of a specimen 0.82 in. thick, and 3 in. x 4½ in. was exposed to heat, and temperature read. The cool side was in contact with air at room temperature of 75 deg. F. Results of this test were as follows:

TIME	COOL SIDE	HEATED SIDE
0 min.	75 deg. F.	75 deg. F.
20 min.	122 deg. F.	480 deg. F.
40 min.	230 deg. F.	780 deg. F.
1 hr. 0 min.	370 deg. F.	1030 deg. F.
1 hr. 20 min.	510 deg. F.	1245 deg. F.
3 hr. 0 min.	....	1640 deg. F.

At the end of the three hour period the specimen was carefully examined. It did not show any cracks, popping or spalling, the only apparent change being in color.

This new building material compares very favorably with other standard building materials in all its characteristics, and no efflorescence is exhibited after prolonged exposure to severe conditions.

Practical Applications

Rostone is claimed to be ideal for the following applications:

(1) Exterior facing material on steel buildings of any size.
(2) Interior wall, ceiling and floor construction.
(3) Ornamental construction for interiors.
(4) Hollow tile, brick and block.
(5) Decorative shapes such as vases, boxes, lamp bases, etc.
(6) Intaglio tile.

Construction has been done with this new material, in both regular shapes and ran-

Some practical applications of the new "rock product"

dom ashlar, with pleasing and economical results. A model house, using Rostone, is now being built at "A Century of Progress" in Chicago, in which many applications of the material will be made.

Another application of Rostone, somewhat different, has been developed. A veneer facing of Rostone is pressed on fibre board, in any size or shape required, and in any color, making it suitable for a combined tile wall finish and insulation. Small tile units can be produced, but in line with the original ideals of the designers, that of low cost homes, it seems preferable to cast large units of the product with false joints, simulating small tile sections. Advantages claimed for this material are: Lightness in weight, insulation properties, ease of installation, permanent coloring and economy. No other matrix or adhesive, other than the Rostone mix itself, is necessary to give a perfect joint between the fibre board and the finished veneer of Rostone.

It is estimated that by using this new material, Rostone, homes ordinarily prohibitive to the average person will be within the reach of all builders, it eventually being possible to build a Rostone and steel home for but little if any more than a frame house of similar size.

Organization

Rostone is the invention of David E. Ross, Richard L. Harrison, Harry C. Peffer, Paul Jones and Floyd P. Wymer, of Lafayette, Ind., and is covered by more than 30 patents. The present plant, designed for experimental work, is located 17 mi. southwest of Lafayette, at Riverside.

Personnel of the Rostone Co. includes: David E. Ross, President; Harry C. Peffer, vice-president and technical consultant; Richard L. Harrison, secretary, treasurer and general manager; John Paul Jones, chemical engineer, and Floyd P. Wymer, mechanical engineer. Prof. R. Norris Shreve, of the department of chemical engineering, Purdue University, has added much to the development of Rostone, through his capacity as consultant. H. E. Merwin of Washington, D. C., has made the numerous X-ray pictures and studies of various stages of the reactions and under various conditions. Dr. F. O. Anderegg, Pittsburgh, Penn., contributing editor of ROCK PRODUCTS, has acted as consultant on the physical testing of the new material.

Beg Your Pardon!

IN ANNOUNCING election of officers of the Ohio Sand and Gravel Producers' Association in the February issue of ROCK PRODUCTS the position of Stephen Stepanian was misstated. Mr. Stepanian is vice-president and general manager of the Arrow Sand and Gravel Co. He succeeds J. J. Gorman, president of the Zanesville Washed Gravel Co. A. E. Frosch, newly elected vice-president, is secretary-treasurer and general manager of the Eastern Ohio Sand and Supply Co. of Steubenville.

Development of Sand and Gravel Deposits

Reviewed by Edmund Shaw

Contributing Editor, Rock Products

"DEVELOPMENT OF SAND AND GRAVEL DEPOSITS" is the third of a series, written by J. R. Thoenen and published by the U. S. Bureau of Mines, which eventually will cover the entire field of sand and gravel production. The previous publications are, "The Economics of Sand and Gravel Developments," and "Prospecting and Exploration for Sand and Gravel." The first reviews the economic conditions that justify the starting of a new sand and gravel operation and the second tells how the deposit should be investigated to show whether or not it can be worked at a profit. The present publication tells what is necessary to put the deposit into shape so that the material may be dug from the bank, transported to the plant and washed and screened and loaded out in the most economical way.

No one who has had any experience in sand and gravel operation needs to be told that this third step—development—is as important as any. There have been plenty of failures from insufficient prospecting and a few from lack of operating skill and experience. But probably a cause of as many failures as either of these has been the failure to develop the deposit properly and *economically*. For it is possible to spend more in development than the recoverable and saleable material will justify. It is to show how to avoid such failures that the present book has been written.

It is an excellent presentation of the subject and the writer regrets that it was not available ten or twelve years ago, when the golden era of the business was beginning and so many large-scale operations were started. It would have obviated a lot of expensive education by trial and error. It was the reviewer's first criticism that too much of the book was given to the development of deposits on a scale that is rarely needed today, when the tendency is toward more and smaller plants in the place of one big plant. But, as Mr. Thoenen pointed out in correspondence, the methods outlined cover the smaller operations of the same type, and large scale development can never become obsolete. And the reviewer would add, on reflection, that this part of the book is invaluable, for there is nothing else that covers the same subject so adequately, the books on engineering of excavation being altogether too general.

The book, or pamphlet, contains 50 pages. The first eight are of a general nature and discuss features that affect all development, the nature of the deposit, the overburden, the characteristics of the material and the methods of transportation and washing and so on. The next seven pages discuss development as a coordinating agent, which is said to be the planning and arrangement of operations in such manner and sequence as will require the minimum expenditure of money, labor and power in conducting these operations. Then follows a few pages on types of deposit, classified somewhat according to the kind and amount of development they require.

In the next section, about one-half of the book, are described the methods of opening bank deposits for power shovel dragline or cableway excavation on a good sized scale. A concrete case is taken and studied by the aid of maps and sections, and the way in which the different machines strip and open the deposits is made very clear. Three principal methods are illustrated, stripping and excavating with a shovel, stripping with dragline and excavating with dragline or shovel, and stripping with a cableway scraper for excavating with a shovel. Working with straight thorough cuts and with circular cuts is explained and the advantages of each are given. Costs are quoted from actual operation reports. Some of these will probably be found rather higher than the same work could be done for today, but this gives them the advantage of being on the safe side.

The concluding pages include a bibliography and typical examples of development from operations in New York, New Jersey, Kentucky, Texas, California, Oregon, Michigan and Pennsylvania. The operating machines for these include pump dredge, ladder dredge, clamshell dredge, power shovel, dragline and cableway excavator. Costs are given in some cases. The bibliography includes 10 publications of the Bureau of Mines, 15 articles from *Pit and Quarry* and 41 articles from ROCK PRODUCTS.

The book is an excellent presentation of the subject and no one could have written it who had not had Mr. Thoenen's wide experience in mining and rock products engineering and the ability he has shown in so many publications, to write of such matters interestingly as well as clearly and concisely.

Fire Test of Gypsum Lath

THE U. S. Bureau of Standards reports on several fire tests of partitions covered with gypsum plaster on gypsum lath. With plain lath and a 1:2 sanded plaster the time to failure was 55 min.; with perforated lath the time was 1 hr. 28 min. Failure was due either to inability to sustain load or to temperature transmission. The 50% increase in fire resistance with the perforated plaster board over the plain board is ascribed to the better keying of the plaster.

Facts About Sand and Gravel Industry

Half the Total Number of Operations Produce Less Than 25,000 Tons Per Year, But Only 3.6% of the Industry's Total Output Comes from These Little Plants

AN ANALYSIS of the U. S. Bureau of the Census and Bureau of Mines figures on the sand and gravel industry for 1927 and 1929, has been made by H. Herbert Hughes and F. E. Berquist of the U. S. Bureau of Mines. While neither 1927 nor 1929 may be a typical year, the figures are interesting in showing the actual concentration of the industry in the hands of some 800 relatively large operators, in spite of the numerous small plants, which have caused so much concern to commercial producers.

In 1927, 834 or 50.15% of the 1,663 companies which reported to the Bureau of Mines produced less than 25,000 tons each. This group, however, accounted for only 3.63% of the total production. A second group, comprising those whose output ranged from 25,000 to 100,000 tons, included 459 producers or 27.6% of the total number; 14.15% of production was reported by this group. The remaining 370 operators, although representing only 22.25% of the companies, accounted for 82.22% of the total production.

The census figures for 1929 listed 1,165 sand and gravel operations by 957 concerns, of which 464 operations by 423 producers had annual outputs of less than $50,000 value. The smaller, more or less temporary operations of less than 25,000 tons per year, were ignored in the census. These 464 operations accounted for but 13% of the total output in 1929. In other words, 701 operations by 534 concerns accounted for 87% of the production of commercial sand and gravel in 1929.

If the number of small operations has increased materially since 1929, as the authors seem to think, it has probably been due to the proportionately larger tonnages of sand and gravel used for highway construction in the last three years, because of the slowing up of other types of construction, rather than to any fundamental changes in character of the industry. With a return to normal business conditions, with more construction in and near population centers, the established plants of larger productive capacities and with railway hauls will undoubtedly again assume their previous economic importance.

According to the census, the sand and gravel industry in 1929 ranked sixth among all mining and quarrying industries in value of output and in number of wage earners employed. In 1930 the tonnage of sand and gravel, exclusive of glass sand, 195,202,625, was greater than that of any other nonmetallic mineral, exclusive of fuels. In tonnage of revenue freight sand and gravel normally occupies second place, exceeded only by bituminous coal, but the railway revenue from sand and gravel is only about 10% of that from bituminous coal, due to the shorter haul, as well as lower tonnage.

Of all the money spent by contractors for construction materials in 1929, 10.4% went to buy aggregates of one kind or another; 8.9% for cement; a total of nearly 20% of all expenditures for construction materials therefore goes to rock products producers, not including lime or gypsum. Including these the construction materials industry is at least 22 or 23% rock products.

Tables from the 1929 census report, showing the type of operation, according excavating method, give 207 shovel operations, 201 dragline (evidently including cableway excavators), 235 pump dredge, 48 ladder dredge. These figures are incomplete and misleading because they cover only those enterprises each of which operated a single plant in which but one type of excavating equipment was used. They do show, however, that all of the three types of operation, shovel, dragline and dredge, are about equally popular. Compared by tonnages produced shovel operations accounted for 33,776,000 tons; dragline, 18,786,000; pump dredge, 35,641,000; ladder dredge, 12,931,000 tons. These tables account for but 101,134,000 tons of the 168,886,000 tons produced in 1929 by operations of over 25,000 tons annual production each.

Cementing Value of Crushed Gravel Screenings*

By Ray V. Warren

Engineering Representative, Western Pennsylvania Sand and Gravel Association

THE "cementing value" of stone or rock dust has always been considered important in the selection of material for macadam type roads. Little data exist on the cementing value of dust from crushed gravel—almost none on the cementing value of the dust from crushed gravel from the Ohio and Allegheny rivers near Pittsburgh, Penn.

Various methods of laboratory testing of cementing value are in use, most of them patterned after that of the U. S. Bureau of Public Roads. Laboratory tests by this method were made recently by the Pittsburgh Testing Laboratory of crushed gravel screenings taken from the commercial stock pile of J. K. Davison & Bros., New Kensington, Penn., a mechanical analysis of a sample showing the following:

Passing a 5/8-in. screen	100 %
Passing a 3/8-in. screen	98.3%
Passing a No. 4 mesh, U. S. Standard	84.6%
Passing a No. 20 mesh, U. S. Standard	45.9%
Passing a No. 50 mesh, U. S. Standard	24.3%
Passing a No. 100 mesh, U. S. Standard	7.3%

The sample tested for cementing value was prepared as prescribed by grinding in a ball mill (5,000 revolutions) after which the dust was of the following fineness:

Passing a No. 28 mesh sieve, Tyler Standard	100%
Passing a No. 50 mesh sieve, Tyler Standard	84%
Passing a No. 100 mesh sieve, Tyler Standard	52%

The tests of five specimens gave a cementing value ranging from 40 to 61, with an average of 50, on the impact machine. Tested for crushing strength the specimens ranged from 455 to 557 lb. per sq. in., with an average of 496.

The 50 value on the impact machine gives these Pittsburgh gravels a favorable showing beside those obtained by the U. S. Bureau of Public Roads from rock collected in various parts of the country; it makes these crushed gravels eligible, so far as binding or cementing value is concerned, for macadam type pavements under the latest Federal specifications.

The specifications of the Pennsylvania State Highway Department prescribe no numerical standard for cementing value, so that it is not known whether this crushed gravel will answer or not. The term used in the Pennsylvania specifications is "approved cementing value."

*Abstract of much more detailed paper.

Talc and Soapstone

THE total quantity of talc sold by producers in the United States in 1932 was 123,221 short tons, valued at $1,361,633, according to reports furnished by producers. Corresponding figures for 1931 were 163,752 short tons, valued at $1,852,472. Soapstone in the United States is practically all obtained by one company at Schuyler, Va.

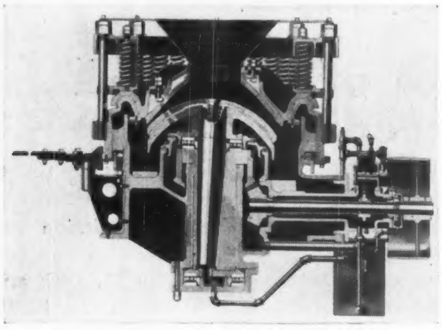
Total imports of talc and soapstone for consumption in the United States also followed the general downward trend.

New Machinery and Equipment

Secondary Crusher

THE Smith Engineering Works, Milwaukee, Wis., announces the Telsmith "Gyrasphere," a spring relief crusher, roller thrust bearings and choke feed. It takes free gravity flow.

The crushing action is said to be unique. All vertical thrust is taken on the end-thrust antifriction bearings, which are especially designed for heavy crushing duty, the manufacturer states. The horizontal crushing pressures transmitted to the eccentric bearings are reduced proportionately. Features claimed for this new crusher are that bell-



Spring relief crusher

mouthed eccentric sleeves are avoided; true shaft alignment is permanently maintained; gears are kept in perfect mesh; long life and low up-keep are assured. It is also claimed to give a more cubical product with fewer slabs and splinters. Another exclusive feature is the rotary head support.

Crushing members are of manganese steel. The entire outer structure, including main frame, adjusting collar and concave bowl, is steel.

The Telsmith Gyrasphere is adjustable to meet a wide range of sizing requirements while crusher is operating.

Refractory

THE Babcock and Wilcox Co., New York, N. Y., announces the addition of a new firebrick, "B & W 80 Junior," to its line of refractory products. The 80 Junior was developed to meet the conditions existing between the moderate service economically met by fireclay refractories and the severe conditions met by the B & W 80 firebrick.

It is for this field, in which fireclay brick are unsuitable, or are only moderately satisfactory, from the standpoint of service life, and in which the B & W 80 firebrick is uneconomical because of its high price, that the B & W 80 junior was developed.

It has a melting point of 3175 deg. F. and its pyrometric cone equivalent is 33. Its shrinkage is 0.85% after reheating at 2900 deg. F. for 5 hr., the manufacturer states.

Alloys for High Temperatures and Corrosion Service

THE American Manganese Steel Co., Chicago Heights, Ill., announces termination of contract with F. A. Fahrenwald. The present agreement provides that Amsco retains the right to use certain patents issued and pending while the right to the exclusive use of the registered trade name "Fahralloy" has been granted Mr. Fahrenwald.

The company states that nickel-chromium alloys which it makes shall hereafter be known as "Amsco Alloys."

Circuit Breakers

ANNOUNCEMENT of three new circuit breakers is made by the General Electric Co., Schenectady, N. Y. One series is a manually and electrically operated, trip-free, multi-pole unit suitable for the control and protection of circuits in all fields. The ratings of this series, Type AB-2, range from 15 to 400 amperes, 250 volts direct current, and 600 volts alternating current. Two independent overcurrent tripping devices are included. Enclosing cases are thoroughly insulated to prevent arcing.

A second series provides oil-filled bushings of a new type. These are rated 15, 25, and 34.5 kilovolts. Oil-blast principle of circuit interruption provides operation in eight cycles. Type FHKO-339 breakers are designed for either indoor or outdoor service, and have interrupting ratings of 500,000 to 1,500,000 kv.-a.

A third series combines oil circuit breaker and group-operated disconnecting switch, enclosed in submersible housing. Both the circuit breaker and the disconnecting switch have manual operating levers which are so interlocked that the switch cannot be operated when the breaker is closed, nor can the breaker be closed when the switch is open. These breakers can be equipped for electrical operation as well as manual. Ratings run up to 15,000 volts, 2000 amperes.

To Build Armstrong Drills

ACQUISITION of the drill business of the Armstrong Manufacturing Co. by Bucyrus-Erie Co., South Milwaukee, Wis., is announced, effective immediately.

Armstrong contributes 66 years of experience in drill manufacture, Bucyrus-Erie 53 years' experience in the manufacturing of excavating equipment. The merging of these two lines brings together Armstrong's experience in blast-hole drilling and the manufacturing, research and service facilities of Bucyrus-Erie Co.

George R. Watson, formerly president of the Armstrong Manufacturing Co., has become associated with the Bucyrus-Erie Co. and will be in charge of drill business.

Symposium on Steel Castings

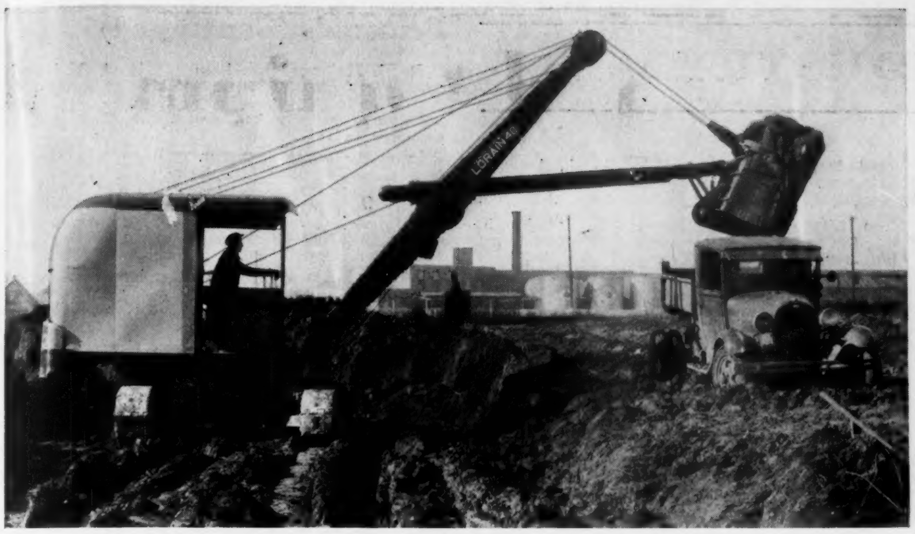
THE presentation and publication of the ten technical papers comprising the Symposium on Steel Castings have been sponsored jointly by the American Foundrymen's Association and the A. S. T. M., the chief purpose being to provide the engineering profession with authoritative information on the properties of steel castings. Carbon-steel and alloy-steel castings are covered.

Extensive oral and written discussion adds to the value of the papers, presenting a broader view of the subjects. Diagrams, charts and tables have been extensively used by the authors to enable a quick and clear presentation of the data.

Chairman of Board and President

THE Sullivan Machinery Co., Chicago, Ill., announces election of A. E. Blackwood as chairman of the board and of H. S. Beal as president, to succeed Mr. Blackwood. Mr. Beal comes to this company from the Jones and Lamson Machine Co. of Springfield, Vt., of which he was general manager. He has been director and president of the National Machine Tool Builders' Association.

New circuit breakers for all kinds of circuits



Dipper stick an all-steel tube

New Line of Crawler Shovel and Cranes

THE Universal Crane Co., Lorain, Ohio, announces a new line of crawler shovel and crane equipment ranging from ¾- to ⅝-cu. yd. capacity, known as the Lorain 40 and 30. The design of this line incorporates features of the Lorain line produced by the Thew Shovel Co. In addition to center drive design a new feature is balanced design, claimed to develop greater capacities per pound of weight. The working weight of the Lorain 40 as a ¾-yd. shovel is approximately 30,000 lb., and the Lorain 30 as a ½-cu. yd. shovel approximately 23,000 lb.

Balanced design includes tilting of the machinery frame towards the rear so that all turntable machinery is grouped far back of the center pin that it may do double duty, counterbalancing loads lifted as well as performing operating functions. Use of alloys is employed freely, the manufacturer states.

Double Side Dump Car

A DOUBLE side dump car with down turning doors developed especially for quarry service is announced by the Koppel Industrial Car and Equipment Co., Koppel, Penn. This car is fundamentally similar to the Koppel "rolling trunnion" type automatic air dump cars, except for the absence of dumping cylinders.

Instead of being self-dumped, the car body is tilted by a specially designed independent car dumper located in the crusher house. The dumper is operated by two pneumatic swiveling type cylinders. Only one man is required to operate the dumper. The chief advantage of this development is that investment is lower than with individual self-dumping cars.

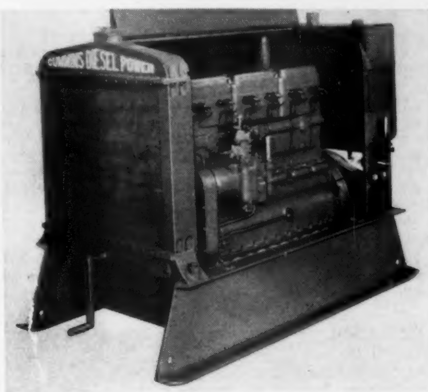
Is dumped at plant by independent car dumper

Diesel Power Units

THE CUMMINS ENGINE CO. announces its "Model H," 4-and 6-cylinder, built up into complete power units.

These units are built with the automotive type of Cummins Diesel. Governed at a maximum speed of 1200 r.p.m., these units are rated at 55 h.p. for the 4-cylinder and 83 h.p. for the 6-cylinder.

The fuel system incorporates the Cummins principles of measuring, gasifying and injecting the fuel.



Diesel-engine unit

Features Screens in Exhibit

WHEN the Cross Engineering Co. of Carbondale, Penn., exhibited samples of its products at the Scranton Industrial Exposition, held from April 30 to May 7, special effort was made to attract the attention of those interested in the rock products industry.

The company placed in prominent positions in their booth conical screens and light, medium and heavy weight flat screens.

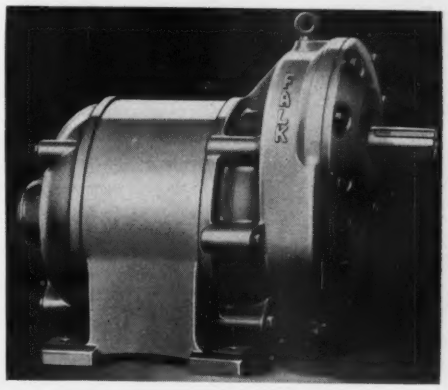
Show Testing Equipment at A Century of Progress

THE most recent developments in both "Universal" testing equipment and balancing equipment will be exhibited and demonstrated at the coming "Century of Progress," by the Tinius Olsen Testing Machine Co., Philadelphia, Penn.

This equipment will include a large 60,000-lb. capacity Universal testing machine with pendulum weighing system with hydraulic loading and all latest attachments.

Combined Motor and Speed Reducer

THE Falk Corp., Milwaukee, Wis., announces the "Motoreducer" which combines a motor and gear unit, especially designed for relatively low ratios, both speed



Reduces through single-pair gear train

reduction and speed increase. With high speed motors ratios from one-ninth motor speed to about two and one-half times the motor speed may be obtained. Variation of speed is obtained with a simple single-pair gear train.

Mark R. Woodward Joins Babcock and Wilcox

THE Babcock and Wilcox Co., New York, N. Y., announces the addition of Mark R. Woodward to its cement equipment division. For the last 15 years Mr. Woodward has been assistant chief engineer of the Lehigh Portland Cement Co. with headquarters in Allentown, Penn., and an active member of the A.I.E.E. Mr. Woodward will be located in the Chicago office of the Babcock and Wilcox Co.

THE INDUSTRY

New Incorporations

Edmundson Gravel Co., Gainesville, Tex. Incorporators—J. L. Willmann, J. S. Edmundson and W. V. Bueltman.

New Orleans Cement Products Co., Inc., New Orleans, La. 1000 shares.

Green River Limestone Products Co., Hardyville, Ky. Incorporated by R. L. Paul and W. A. Hatcher with $10,000 capital.

Lake Bryan Silica Sand Co., Inc., Orlando, Fla. J. H. Coberly and J. P. Cowart.

Central Lime Rock Co., San Antonio, Tex. Capital stock $100,000. Incorporators: J. C. Von Arx, S. C. Campen and Andrew Dilworth.

Garden City Sand and Gravel Co., Chicago, Ill. 50 shares no par value. Incorporators are Meyer Silverstein, Ben Copple and Myrna Servins.

Benson-Finnerty Co., Inc., New York, New York. To deal in portland cement. Incorporators: Walter Benson, Charles Finnerty and John T. Kreeger, Jr.

Vonder Haar Sand and Gravel Co., Luxemburg, (P. O.) St. Louis, Mo. To produce and deal in sand and gravel. Incorporators: Mrs. Alice J. Vonder Haar, Joseph H. Vonder Haar and Max A. Schmitt. Capital stock $5,000.

Superior Sand Corp., Columbus, Ohio. 250 shares no par.

Mississippi River Gravel Co., Rosedale, Miss. Capital, $10,000.

Rich Boro Ready Mixed Concrete Co., Inc., Stapleton, L. I., N. Y. To deal in portland cement and ready-mixed concrete. Edw. J. Fanning, Catherine Rooney and Estelle Stuart.

Kaw Valley Sand and Dredging Co., Kansas City, Mo. Capital, $5,000.

Madlem Artificial Stone Co., Newport, Ky. Capital, $1,000. Chartered by Charles E. Lester, Jr., M. K. De LaForet and Howard Peper.

East Providence Quarry, Inc., Providence, R. I. Capital stock 100 shares no par value. Incorporators: Horace L. Weller, George C. Davis and Russell P. Jones.

Roy F. Roberts and D. K. Dover, West Asheville N. C., have formed a construction company and will handle stone, sand, gravel and cinders.

City Sand and Gravel Corp., Manhattan, N. Y. Sand and gravel beds, etc. Jacob I. Goodstein, 2,250 shares preferred and 5,000 shares common stock.

Blue Ridge Mining Co., Micaville, N. C. To deal in handling and selling of feldspar, mica, cynite and all mineral products. Authorized capital stock, $100,000. H. A. Dunham, P. Rogers and Rudolph Glatly are the incorporators.

Island Sand and Gravel, Inc., Newport, R. I. Capital stock, $5,000. Incorporators: Joseph M. Tavares, Jesse M. Tavares and Manuel Souza.

Sandusky Lime Products Co., Toledo, Ohio. 5,000 shares no par. Incorporators are L. E. Johnson, C. V. Wolfe and R. H. Rogers.

Walter Deacon and Co., Inc., Quincy, Mass. Granite and stone products. 200 shares common no par value. Walter C. Deacon, Howard J. Deacon and Charles A. Deacon.

Nassau Concrete Products Corp., Forest Hills, L. I., N. Y. 200 shares common. Incorporators: John J. Kiesling, John A. Feulner, Kenneth W. Carson and Arthur H. Priest.

Davidson Granite Co., Decatur, DeKalb County, Ga. To quarry granite and stone.

Sand and Gravel

Altmar Sand and Gravel Co., Altmar, N. Y., has entered involuntary bankruptcy with assets of $100,000.

Pioneer Sand and Gravel Co., Seattle, Wash., has completed a new office building at 820 Fairview Ave., Seattle.

Sangravel Co., Paducah, Ky., has been granted permission to dredge gravel from the Ohio River at Maysville, Ky. The company has a contract for supplying gravel for the construction of the Flemingsburg-Morehead highway.

Golden Sand and Gravel Co., Johnson City, Tenn., was adjudicated bankrupt, April 29.

Goodwin-Gallagher Sand and Gravel Corp., New York, N. Y., has moved its office to 551 Fifth Avenue.

Peter Milliron Sand and Gravel Co., East Liverpool, Ohio, has been awarded contract by Booth and Flinn, contractors for the Pittsburgh Coal Company's 13-mile railroad between Negley, Ohio and the Ohio river at Smith's Ferry, Penn., for 150 carloads of crushed stone and 25,000 tons of sand to be used in the concrete lining of the tunnel to Beaver creek hillside at Grimm's bridge.

Sand Drying Co., Ten Mile, S. C., between Meeting St. Highway and Atlantic Coast Line R. R. tracks, suffered a fire loss recently of $8,000.

Iron City Sand and Gravel Co., Pittsburgh, Penn., has brought suit in the U. S. District Court at Pittsburgh against the Jones and Laughlin Steel Corp. for damage done to a fleet of two towboats, barges and floating equipment as the result of the recent floods in the Ohio river. The sand and gravel company states that a loaded barge of the steel company crashed into their fleet doing damage to the extent of more than $75,000.

Hershey Gravel Co., Hersey, Mich., whose plant burned last summer has completed its new plant and is starting its season's run.

Whittemore Sand and Gravel Co., Cambridge, Mass., has recently installed a transit mix concrete plant.

Eureka Mica Co., Waynesville, N. C., shipped its first carload recently and reports prospects encouraging.

Pure Rock Asphalt Co., Louisville, Ky., filed a voluntary petition of bankruptcy, May 2, listing liabilities $12,485 and assets at $25,505.

Pettinos Graphite Works, Bethlehem, Penn., was damaged to the extent of $10,000 on May 2, by fire.

Quarries

J. E. Osborn and Son, Belle Center, Ohio, have recently installed a Niagara stone washer said to be capable of handling 100 tons per hour.

Borrman Stone Products, Inc., Pottsdam, N. Y., announces a change in the company's name to Northern Quarries, Inc. The company is branching out into the agricultural limestone business. William F. Borrman is president and general manager, William B. Spellman is first vice-president, F. L. Borrman, second vice-president and superintendent, and F. J. Wagner is secretary.

Waldo and Denton, Tulsa, Okla., is starting operating a black marble quarry one-half mile east of Leslie, Ark., to crush the material for terrazzo.

Louisiana Limestone Products Co., near Easton, La., is arranging to make connections to the Chicago Rock Island and Pacific railway at its main line in Easton.

Bluffton Stone Co., Bluffton, Ohio, has completed construction of a 1000-ft. siding connecting its plant with the Nickel Plate railroad.

West Process Paving Co., a Kentucky concern, is building a plant to manufacture an asphalt product for road repair work at the plant of the France Co., Bloomville, Ohio.

Hodgins Quarry Co. is the new name of the former Wolf Valley Stone Co., Hortonville, Wis. The company has recently added pulverizing equipment to make agricultural limestone.

Belmont County, St. Clairsville, Ohio, commissioners will install and operate a stone quarry on the Ball-Egypt Road in the northwest part of the county. The plans are to quarry about 25,000 tons a year. For several years the county has purchased about 100,000 tons per year. It is reported that if the Egypt experiment is a success it is planned to establish similar quarries in all parts of the county where limestone deposits can be obtained.

Michigan Alkali Co., Wyandotte, Mich., has added a heavy duty "Jigger" vibrating screen to its plant equipment.

Cement

Alpha Portland Cement Co., Cementon, N. Y., is reopening its mill after installing new machinery including rock dryers and hammer mill.

Marquette Cement Manufacturing Co. is reported to have suspended operations at its Cape Girardeau, Mo., plant for the first time since this plant was acquired by the company in 1932. Shipments are being made on the Illinois river to Mississippi river points from the company's mill at La Salle, Ill.

Cement companies in all parts of the country are announcing the reopening of their mills during the past two weeks.

Personals

H. W. Cope, formerly assistant director of engineering has been appointed to the vice presidency of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., responsible for the coordination of certain headquarters engineering departments and district office engineers. Mr. Cope is a graduate of Purdue University and joined the Westinghouse organization in 1898.

Personals (Continued)

R. E. Hellmund has been appointed chief engineer Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn. Mr. Hellmund is a German university graduate and joined the Westinghouse company in 1907.

John P. Harris, manager Chicago office Industrial Chemical Sales Co., New York, N. Y., was elected president of the American Oil Chemists' Society at their recent meeting in New Orleans. Mr. Harris graduated from the University of Kansas in 1907 and has been associated with various chemical concerns since.

J. Ray Dellinger has been appointed superintendent in charge of operation of barium products of the plant of the Georgia Ochre Co. near Cartersville, Ga.

Albert G. Davis, vice-president, General Electric Co., in charge of patents retired on May 1. He graduated from Massachusetts Institute of Technology in 1893 and after two years in the United States patent office at Washington, D. C., he began his work with the General Electric Co. as patent attorney. He is succeeded by Charles E. Tullar, manager of the company's patent department.

Burt F. Stauffer has been appointed general manager of the Miller Rubber Products Co., Inc., division of the B. F. Goodrich Co., succeeding R. T. Griffiths, assigned to other duties.

Robert P. Butchart, president British Columbia Cement Co., celebrated his 77th birthday, March 30. He is traveling in Europe with Mrs. Butchart at present.

Marion Wasson, formerly of the Ozark Lime Co., has been appointed bank commissioner of Arkansas.

Major George M. Thomson, research director, Canadian Gypsum Co., recently spoke before the Royal Canadian Institute.

Mrs. John Prince, wife of the president of Stewart Sand and Material Co., Kansas City, Mo., was injured recently when the horse she was riding fell on a turn in the track. Her recovery is reported to have been rapid.

Carney Hartley, consulting engineer, Denver, Colo., has moved his office to 200 Wilda Bldg.

W. H. Hoagland, Columbus, Ohio, president, Marble Cliff Quarry Co., is one of an advisory committee of eight recently named by Governor White to serve during the financial crisis when banks were closed.

Thomas J. Pendergast, Kansas City, Mo., vice-president of the Ready-Mixed Concrete Co., was recently the subject of an eulogistic article in the *American Magazine*.

W. B. Paulson is now representing the Flexible Steel Lacing Co. in Ohio and adjacent West Virginia and Kentucky territory succeeding the late James S. Fitzgerald.

N. C. Hurley has been elected president of the Independent Pneumatic Tool Co., Chicago, Ill., succeeding R. S. Cooper, who was named vice-president in charge of Eastern operations.

W. H. Hoagland, president of the Marble Cliff Quarries, Columbus, Ohio, was recently chosen a vice-president of the Ohio Good Roads Federation.

Prof. Raymond Lilley of New York University recently addressed a meeting of Geographers' and Physiographers' Club in New York on "Recent Developments in Potash Mining."

Walter Good of the Atlas Rock Co., Oakdale, Calif., recently told members of the Stockton Engineers' Club that gravel crushed by his company yields about $40 worth of gold per 1000 tons of gravel crushed.

Herbert A. Snow, secretary, treasurer and sales manager of the Portland Cement Co. of Utah, Salt Lake City, was recently selected as the representative of cement and plaster on the board of directors of the Utah Building and Construction Congress.

Foster Dee Snell, has been appointed consulting technical editor of *Soap*. Dr. Snell has written technical articles on detergents and detergency for that publication for some years.

Nelson E. Chance, formerly district manager of the Houston office of the Brown Instrument Co., has been appointed assistant sales manager with headquarters at Philadelphia, Penn.

John E. Zahn, secretary of the United States Portland Cement Co. of Denver, Colo., has been elected chairman of the Denver chapter of the American Red Cross.

O. B. Wilson, formerly manager of the Cleveland, Ohio, office of the Brown Instrument Co., has been appointed district manager of the territory comprising Texas, Louisiana and southern Arkansas.

Stewart S. Neff, structural engineer for the Portland Cement Association, Buffalo, N. Y., has been named a member of the committee on industrial rehabilitation.

Roy S. Adkins has been appointed district manager of the North American Cement Co. with offices in Washington, D. C. His territory includes the District of Columbia, the north part of Virginia and the south of Maryland.

Henry H. Jones, formerly general superintendent of the Utah Rock Asphalt Co., Sunnyside, Utah, is now city engineer at Helper, Utah, and has contracted for the entire output of the Sunnyside plant. The plant has a capacity of 200 tons daily.

Fred Swineford, Marble Cliff, Ohio, was chosen president of the Ohio Engineering Society at the 54th annual meeting recently. Mr. Swineford is chief engineer of the Ohio Crushed Stone Association.

H. G. Nevins, Chicago, Ill., has been employed to represent the Dewey Portland Cement Co. in the greater Chicago district. Mr. Nevins, in addition to selling Dewey portland cement, will promote the sale of Dewey's two special products, Dewey mason's cement and Dewey "Super" cement.

Obituary

Harry Donnelly, 59, vice-president, Cincinnati Sand and Gravel Co., and founder of the Ohio Gravel Ballast Co., died at his home, March 19.

Leon Gelinas, manager Consolidated Oka Sand and Gravel Co., died in his home at Montreal, March 7.

William O. Schultz, 62, one time president of the Western Lime Co., Denver, Colo., committed suicide in Los Angeles, Calif., May 13.

Charles Edward Eveleth, 57, vice-president, General Electric Co., died at Schenectady, N. Y., March 25.

H. J. Schwinn, 64, an employe of the Castalia Portland Cement Co. for 33 years, died April 2 at his home.

George C. Barlow, 50, president and general manager, C. S. Barlow and Sons Co., ready-mixed concrete manufacturers of Tacoma, Wash., died at his home there in March.

Earl Van Aldridge, 50, an employe of the Universal Atlas Cement Co. for 25 years, died April 9 in Chicago, Ill.

Mark Truman Swartz, 57, for many years a director of the Dexter Portland Cement Co. before it was merged with the Pennsylvania-Dixie Cement Corp., died at his home in Easton, Penn., December 21. At the time of his death, and for many years previously he had served as president of the Nazareth National Bank of Easton.

David Bloom, well known to the quarry industry at San Mateo, Calif., recently passed away.

George P. Baldwin, 58, vice-president of the General Electric Co., New York, N. Y., in charge of activities connected with steam railroad electrification, died of pneumonia, December 7, after an illness of a few days. Mr. Baldwin was a graduate of Leland Stanford University.

Manufacturers

Earle C. Bacon, Inc., announces removal of its New York, N. Y., offices to 17 John St.

Morris Machine Works, Baldwinsville, N. Y., announces removal of its New York office to 254 W. 31st St.

Chain Belt Co., Milwaukee, Wis., announces appointment of the Keller Tractor and Equipment Co., Inc., Detroit, Mich., as distributors for the Rex line of construction equipment. It also announces appointment of Ray Corson-Elkins Co. of Denver, Colo., as distributor of Rex equipment in Colorado and several counties in Wyoming.

Sprout, Waldron and Co., Inc., Muncy, Penn., announces the new location of its New York office at 223 Cowperthwaite Place, Westfield, N. J., with David E. Smyth as district manager.

Waukesha Motor Co., Waukesha, Wis., announces it will apply a horsepower rating plate to its line of full-power engines in the future.

Link-Belt Co., Chicago, Ill., announces election of Evans Woollen as director for a term of three years.

Marble-Card Electric Co., Gladstone, Mich., has appointed R. H. Garrison as vice-president in charge of merchandising. The company will now seek wider distribution of its electrical equipment.

Gardner-Denver Co., Quincy, Ill., announces appointment of Southern Machinery and Supply Co., Roanoke, Va., as agent for its complete line of equipment.

Worthington Pump and Machinery Corp., Harrison, N. J., announces Walter F. Perkins has resigned to become vice-president and general manager of the Bartlett Hayward Co., Baltimore, Md. Mr. Perkins is succeeded as works manager at Harrrison by Hugh Benet.

Link-Belt Co., Chicago, Ill., announces the Moore-Handley Hardware Co., Birmingham, Ala., have been appointed distributor and direct representative for the entire Link-Belt line of elevating, conveying and power transmitting machinery in the Birmingham territory.

Babcock and Wilcox Tube Co., Beaver Falls, Penn., announces opening of a district office in Tulsa, Okla., under the direction of Carl J. Hochenauer. It also announces that Fritz Hoving has been appointed its West Coast district sales manager. Mr. Hoving will make his headquarters with A. M. Castle and Co., its West Coast agent.

Patterson Foundry and Machine Co., East Liverpool, Ohio, announces appointment of new district representatives to handle its commercial and industrial stokers and auxiliary equipment. Homer-Read Co., Pittsburgh, Penn., has been assigned the Pittsburgh territory and Horace S. Bracken the Johnstown, Penn., territory, and R. W. Matthews the District of Columbia.

Trade Literature

Crushers. Bulletin 1472 contains detailed description of Superior McCully gyratory crushers with complete specifications and list of parts. ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.

Locomotives. Bulletin B29 describes Brookville locomotives series B-1-30 in 4-, 5-, 6-, 7- and 8-ton capacities. BROOKVILLE LOCOMOTIVE CO., Brookville, Penn.

Crushing and Screening Equipment. Bulletin W-32-A describes Western portable crushing and screening plants, Nos. 90 and 100. Various methods of setting up this equipment are illustrated and important elements of construction described. AUSTIN-WESTERN ROAD MACHINERY CO., Chicago, Ill.

Dragline Scraper. Bulletin features the Coyle and Roth dragline scraper, describing features of new design. COYLE AND ROTH, Minneapolis, Minn.

Dragline Buckets. Folder briefly describes construction features and gives specifications of the new Williams D-L dragline. WELLMAN ENGINEERING CO., Cleveland, Ohio.

Pumps. Bulletin 322 describes features and gives sectional drawings of the Byron Jackson sand, gravel and rock pumps. BYRON JACKSON CO., Los Angeles, Calif.

Refractories. Bulletins and folders describe "Carbex" silicon carbide brick and its characteristics in boiler and industrial furnace applications. GENERAL REFRACTORIES CO., Philadelphia, Penn.

Welding Equipment. Bulletin HW2 describes the "P and H Hansen" arc welder, illustrating various mountings and improvements in this equipment. Various types of application of welding are also shown. HARNISCHFEGER CORP., Milwaukee, Wis.

Welding Rod. Booklet describes physical and welding characteristics of "Oxweld No. 25M" bronze patented welding rod. Applications in joining metals and building up wearing surfaces are also described. Proper flame adjustments are discussed. LINDE AIR PRODUCTS CO., New York, N. Y.

Bulk Cement Handling Equipment. Bulletin 632 describes Sprout-Waldron vertical screw elevator for unloading bulk cement. Installation details and specifications are shown. Harm Turn-o-matic cement batch checker is also described. SPROUT, WALDRON AND CO., INC., Muncy, Penn.

Thickeners and Ball Mills. Grinding costs of nonmetallics are shown from actual operating records and a description of Hardinge spiral thickeners is given. HARDINGE CO., INC., York, Penn.

Wire Cloth. Catalog 44 discusses spring steel wire cloth for use in sand, gravel, slag, crushed stone and other plants. NATIONAL WIRE CLOTH CO., St. Paul, Minn.

Termite Prevention. Technical literature discusses the "Ferox" process, an integral treatment which is claimed to protect Celotex products from fungus growth and termites. CELOTEX CO., Chicago, Ill.

Concrete Beam Testing Machines. Bulletin 9 describes the pendulum dial load indicator lever weighing system. TINIUS OLSEN TESTING MACHINE CO., Philadelphia, Penn.

Testing Sieves. Folder describes the "End-Shak" testing sieve shaker and the U. S. standard and A. S. T. M. standard cornerless testing sieves. Technical data are included. NEWARK WIRE CLOTH CO., Newark, N. J.

Motion Pictures. GES-402B shows many ways in which motion pictures and sound movies may be used in the promotion and sale of industrial products, appliances and equipment. GENERAL ELECTRIC CO., Schenectady, N. Y.

Dust Collection System. Bulletin 1391 describes the Blaw-Knox framed bag dust collector, discussing dust collecting problems and features of equipment. Specifications are included. BLAW-KNOX CO., Pittsburgh, Penn.

Material Handling Pumps. Specification sheet gives detailed description of the Amsco Type "C" pump. AMERICAN MANGANESE STEEL CO., Chicago Heights, Ill.

Propeller Pumps. Catalog B-6 graphically describes axial flow pumps for handling relatively large volumes of liquid against comparatively low heads at high rotative speeds. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

Chromium Tubes and Pipe. Bulletin discusses 4 to 6% steel tubes and pipe for refinery and other services. BABCOCK AND WILCOX TUBE CO., Beaver Falls, Penn.

Pulverizer and Drying Equipment. Bulletin describes the Raymond line of pulverizing and mill drying equipment, including mechanical air separation devices. RAYMOND BROS. IMPACT PULVERIZER CO., Chicago, Ill.

Spray Nozzles. Sectional catalog lists all products of the Binks Manufacturing Co. Bulletin 6-A, one section of this catalog, is devoted to Binks spray and atomizing nozzles for washing sand, gravel, and crushed stone. Method of installation is illustrated. BINKS MANUFACTURING CO., Chicago, Ill.

Fill Settlement Book. "Accelerating Swamp Fill Settlement with Explosives" is the title of book devoted to highway fill acceleration by use of explosives. Much information and data is given and many illustrations are included. HERCULES POWDER CO., INC., Wilmington, Del.

Steel Chains. Catalog 1192, a 144-page catalog, contains information on all-steel chain, with attachments and accessories which it makes. Data on sprocket wheels are included. LINK-BELT CO., Chicago, Ill.

Drill Steel. Catalog describes "Swede" steel, giving miscellaneous data and specifications of steel for many requirements. PARAGON STEEL AND TOOL CO., East Rutherford, N. J.

Trucks. "Mack Transport news" is a new publication reporting new developments, new methods, new equipment, new truck and bus models, new trends, new operators and new services in the motor truck field. MACK-INTERNATIONAL MOTOR TRUCK CORP., New York, N. Y.

Condensers. Bulletin 411 describes jet condensers and auxiliaries for vacuum processes to be marketed by Byer Engineering Associates, New York, N. Y. PENNSYLVANIA PUMP AND COMPRESSOR CO., Easton, Penn.

Totally Enclosed Motor. Folder describes Linc-Weld type E motor with stainless steel enclosure showing features of this type of construction. LINCOLN ELECTRIC CO., Cleveland, Ohio.

Lift Trucks. Circular 104 describes "Gold Flash," a lift truck for loads up to 5000 lb. LEWIS-SHEPARD CO., Boston, Mass.

Testing Equipment. Bulletin 8 describes Olsen-Andrew road surface rater for measuring unevenness of newly paved surfaces. TINIUS OLSEN TESTING MACHINE CO., Philadelphia, Penn.

Arc Welder. "Weld It Well" describes latest developments in welding practice and welder design. Old-time practices compared with modern welding methods and the P and H Hansen arc welder are described in detail. HARNISCHFEGER CORP., Milwaukee, Wis.

Locomotives. Bulletin 500 describes the new series of Brookville locomotives with Caterpillar engines. BROOKVILLE LOCOMOTIVE CO., Brookville, Penn.

Truck Tires. Profusely illustrated booklet describes the Zero pressure tire for tractors, graders, mowers and maintainers. B. F. GOODRICH RUBBER CO., Akron, Ohio.

Shovel. Bulletin gives illustrated description of the new 16-B, ½-cu. yd. shovel-dragline-crane-clamshell-dragshovel-skimmer scoop. BUCYRUS-ERIE CO., South Milwaukee, Wis.

Shovel. Catalog describes the Speeder Model B-3, ½-cu. yd. shovel crane and dragline. SPEEDER MACHINERY CO., Cedar Rapids, Ia.

Drill Sharpener. Broadside describes the "Little Smithy," a portable drill sharpener. SULLIVAN MACHINERY CO., Chicago, Ill.

Grinding Mill. Engineering report gives result of investigation of the Hadsel mill. HARDINGE CO., INC., York, Penn.

Rubber Belt. "Lubricated with Rubber" is title of booklet describing highflex belts. B. F. GOODRICH RUBBER CO., Akron, Ohio.

Stokers. Booklet describes the Patterson heavy duty underfeed stoker, showing details of construction and installation. PATTERSON FOUNDRY AND MACHINE CO., East Liverpool, Ohio.

Steam Power Plant. Booklet describes the steam power plant in the Newark Evening News building. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

Pumps. Bulletin describes factors influencing the efficient operation of centrifugal pumps. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

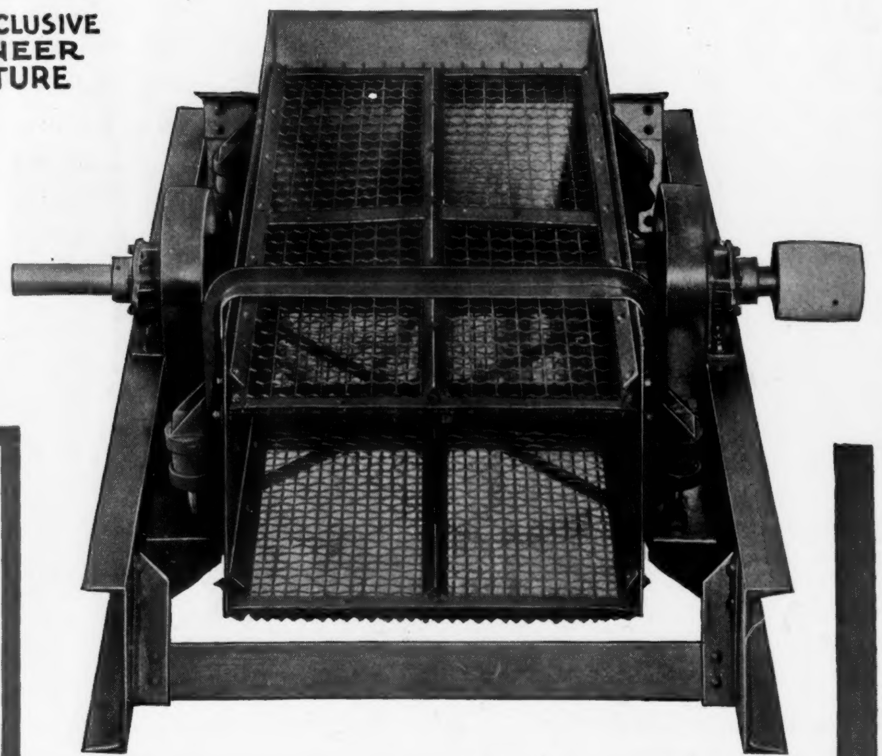
Lubricants. Technical bulletin discusses the importance of colloidal-graphited lubricants in "running in" operations. ACHESON OILDAG CO., Port Huron, Mich.

Dust Collecting Equipment. Folder features Pangborn dust collection equipment for industrial requirements. PANGBORN CORP., Hagerstown, Md.

PERFECT BALANCE

BUILT IN

AN EXCLUSIVE PIONEER FEATURE



THE PIONEER VIBRATOR SCREEN

Five Sizes

SINGLE OR DOUBLE DECK

2 ft. x 4 ft.
2½ ft. x 5 ft.
3 ft. x 6 ft.

SINGLE, DOUBLE OR TRIPLE DECK

3 ft. x 8 ft.
4 ft. x 8 ft.

•

$940.00

for the 4'x8' double deck screen without mounting frame

Extra for Mounting Frame $160.00

POSITIVE DRIVE—ANTI-FRICTION BEARING

It is an accepted fact that the positive drive and anti-friction bearing Vibrator Screens are the most efficient

now Pioneer adds a new feature— perfect balance built in

The Screen Pan is balanced in itself and the eccentric shaft with machined flywheels and screen pan are also balanced after assembly. The eccentric shaft runs in heavy duty self-aligning S. K. F. anti-friction bearings mounted in dirt proof machined housings, labyrinth style. The Screen Pan is adjustable to slope and embodies a simple and positive means of keeping the wire mesh in proper tension. Two clamping side bars allow quick change of screen frames. Operates at 1200 r. p. m. with uphill action from 22 to 27 degrees.

Pioneer Gravel Equipment Mfg. Co.

1519 CENTRAL AVE. | **AND THERE IS A DEALER NEAR YOU** | MINNEAPOLIS, MINN.

PLYMOUTH «« A Profit Maker For Texas Construction Material Co.

Mr. H. F. Miller of Texas Construction Material Company, writes:

"Our 20-Ton Plymouth Locomotive was a part of our original plant installation and its operation has been and is entirely satisfactory." It is used principally for spotting cars at the two plants which are located 1000 feet apart. Plant No. 1 requires approximately six "spots" an hour, Plant No. 2, two "spots" an hour. Three two-mile hauls a week are made to the intersection of the industry track with the main line of the Railroad. Each haul carries eight 200,000 gross load cars and returns with light engine.

That a PLYMOUTH Locomotive will prove very profitable for sand and gravel pits and quarries is evidenced, not only by the fine work it is doing for Texas Construction Material Company, but for HUNDREDS of other similar companies. A list of Plymouth users in your industry will gladly be mailed to you so that you can get a general idea of what your competitors are doing to reduce their haulage costs to a minimum. During these times especially, a saving in haulage costs often represents the difference between a profit and a loss in operation.

A bulletin describing the Plymouths we recommend for pit and quarry use will be mailed free upon request.

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company, Plymouth, Ohio

PLYMOUTH

Gasoline and Diesel Locomotives

Recognized the World Over as the Leader in Its Field

Rock Products

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